



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM:

To: Tim Ciarlo

From: Eric Bohnenblust, Ph.D., Entomologist

Secondary Review: Jennifer Saunders, Ph.D., Senior Entomologist

Date: July 20, 2016

Subject: PRODUCT PERFORMANCE DATA EVALUATION RECORD (DER)

THIS DER DOES NOT CONTAIN CONFIDENTIAL BUSINESS INFORMATION

Note: MRIDs found to be **unacceptable** to support label claims should be removed from the data matrix.

DP barcode: 432900

Decision no.: 511409

Submission no: 977635

Action code: M005

Product Name: RF2228 LH Aerosol

EPA Reg. No or File Symbol: 89459-IU

Formulation Type: RTU Aerosol

Ingredients statement from the label with PC codes included:

Lambda-Cyhalothrin 0.05% PC: 128897

S-Hydroprene 0.36% PC: 128966

Application rate(s) of product and each active ingredient (lbs. or gallons/1000 square feet or per acre as appropriate; and g/m² or mg/cm² or mg/kg body weight as appropriate): For crack and crevice treatments spray surface until slightly wet (1 second per linear foot for heavy infestations - equivalent to 1.25 mg lambda-cyhalothrin and 8.99 mg hydroprene/ft², 1 second per 3 linear foot for light infestations - equivalent to 0.42 mg lambda-cyhalothrin and 2.99 mg hydroprene/ft²);

For void treatments spray 1-5 seconds/3 ft³ depending on infestation size

1 second - equivalent to 0.42 mg lambda-cyhalothrin and 2.99 mg hydroprene/3ft³

5 second - equivalent to 2.1 mg lambda-cyhalothrin and 15 mg hydroprene/3ft³

Use Patterns: Crack and crevice, spot treatments

I. Action Requested: Registrant requested review of 18 MRIDs to support efficacy claims against cockroaches, ants, fleas, spiders, and bed bugs for a combination product containing lambda-cyhalothrin and s-hydroprene.

II. Background: Registrant submitted one new MRID containing efficacy data and cited 17 other MRIDs to support the product. Two MRIDs do not contain data for any public health pests, therefore these MRIDs were not reviewed in support of the proposed product.

III. MRID Summary: (primary reviews are attached)

45477701. Efficacy of Hydroprene Formulations 202-080 and 202-084: Results of Phase 1 Trial.

(4) **Conclusion: Extraneous.** This MRID does not contain data of relevance to any public health pests.

49777511. Efficacy of the RF2228 LH Aerosol Against a Broad Spectrum of Arthropods.

(4) **Conclusion: Extraneous.** This MRID does not contain data of relevance to any public health pests.

11019. Alkyl 3,7,11-Tri-methyldodeca-2,4-dienoates: A New Class of Potent Insect Growth Regulators with Juvenile Hormone Activity.

(1) non-GLP

(2) **Methods:** This study tested six concentrations (1 µl containing 100, 10, 1, 0.1, 0.01 or 0.001 µg of S-hydroprene) of S-hydroprene against larvae of *Aedes aegypti* in small disposable tumblers. Cups were filled with 50 ml of water and 10 4th instar mosquito larvae were added to each cup. There were three replicates of ten larvae per concentration. Larvae were assessed for emergence and efficacy was provided as the inhibition dose₅₀ (ID₅₀) and relative potency.

(3) **Results:** The ID₅₀ for *Ae. aegypti* was 0.021 ppm. The relative potency was 7.1.

(4) **Conclusion: Unacceptable.** The Agency requires 90% efficacy and the ID₅₀ only represents the point where 50% efficacy is achieved. Also, there was no untreated control included in the study and replication is low.

160261. Laboratory Testing of Various Insect Growth Regulators on Three Different Substrates: Glass, Vinyl Tile, Unpainted Plywood [and Apartment Dwellings].

(1) non-GLP

(2) **Methods:**

Study 1: This study tested a 0.02% and 0.06% S-hydroprene aerosolized fogger at a rate of 3 oz/3000 ft³ against German cockroaches. One placebo fogger was used as a control treatment. At the time of fogger release, two replicates each of glass, vinyl tile, and plywood substrates were placed at 6, 9, and 12 ft from the fogger. Substrates were then aged in the laboratory under ambient conditions. Ten to twelve late instar German cockroaches were confined to the treated surface with food and water. Roaches were examined daily for the first 10 days. Cockroaches molting into adults during the first 10 days were removed from the experiment. After 10 days post application, cockroaches were observed every 7 to 14 days and scored for JH effects on adult cockroaches. Final observations were made at 12 weeks post application.

Study 2: A 0.11% permethrin and 0.15% S-hydroprene combination product was tested against German cockroaches in apartments. The product was applied at a rate of 26 oz. per apartment to 21 apartments. Apartments were of unknown size. Apartments were retreated at 4 months post initial treatment. Three sticky traps were placed in each apartment and removed 24 hours after placement to count the number of cockroaches. Traps were placed in the apartment to monitor cockroach populations prior to initial treatment and then monthly for 8 months after initial treatment. The count prior to initial application was intended as the untreated control, there were no concurrent control replicates.

Study 3 (literature review): The last part of the MRID contains a literature review of 10 published and unpublished studies documenting efficacy of hydroprene.

(3) **Results:**

Study 1: In the placebo (control) treatment 78% of adult German cockroaches showed effects of juvenile hormone exposure and did not reproduce. This effect in the control treatment was attributed to a mix up or contamination. Treatment with both percentages of S-hydroprene completely inhibited reproduction of German cockroaches at 8 and 10 weeks post exposure. At 12 weeks post exposure 95 F₁ cockroach nymphs were produced but it is not clear as to what percentage of eggs hatched to produce this number. S-hydroprene (both percentage products combined)

never reduced adult emergence by more than 88%. Cockroaches treated with S-hydroprene (both formulations were pooled) produced 166 ootheca and of those 56 were non-viable. This study does not support efficacy claims for S-hydroprene because control data were not adequate, replication was not adequate, and the reduction in adult emergence was not adequate.

Study 2: At 6 months post initial application (2 months after retreatment), the reduction in the number of cockroaches reached 90%. Prior to retreatment, the percent reduction of cockroaches never reached 70%. This study does not support efficacy claims for the proposed product because the tested product contains permethrin instead of lambda-cyhalothrin and efficacy prior to retreatment did not reach 90%.

Study 3 (literature review): While some of the studies in this section of the MRID show efficacy, it is not clear which tables correspond to which studies, the methods presented are incomplete, the treatments often do not appear to include control groups, the results are highly variable and often less than 90%, the endpoints measured are not always adult emergence or other defined endpoints relating to efficacy claims, and retreatment was often required to achieve 90% efficacy. Therefore these studies either could not be adequately evaluated or are unacceptable and do not support efficacy claims for the proposed product.

(4) **Conclusion: Unacceptable.** This MRID does not support efficacy claims for the proposed product because the studies do not show acceptable efficacy without retreatment, untreated controls were not included in the studies, or the studies could not be adequately evaluated.

40263301. Zoecon RF-270 Emulsifiable Concentrate EPA File Symbol 2724-GLL Response to Agency Letter Dated 9 March 1987.

(1) non-GLP

(2) **Methods:** This study documents data regarding application and spray nozzles for the product and does not contain efficacy data.

(3) **Results:** The results of this study do not apply to efficacy of the product.

(4) **Conclusion: Extraneous.** This MRID does not document an efficacy study and does not support efficacy of the proposed product.

44535509. Cockroach Efficacy Summary for Hydroprene Insect Growth Regulator.

(1) GLP or non-GLP

(2) **Methods and Results:** This MRID contains 10 studies testing efficacy of hydroprene to support the proposed product. They are reviewed below individually.

Study TR 912: Hydroprene was applied to unknown surface types at rates of 0.24 mg hydroprene/ft² and 1.4 mg hydroprene/ft². German cockroach nymphs were then exposed to treated surfaces and periodically evaluated for hydroprene affected adults. The 0.24 mg/ft² was not efficacious, while cockroaches exposed to the 1.4 mg/ft² rate showed effects but molted into adults. This study does not support efficacy claims because the methods are incomplete, the data and methods presented are insufficient and the endpoint of effects (presumably adults displaying wing twisting) instead of preventing adult emergence is not acceptable.

Study TR-1126: This study was a field study where a 0.25% permethrin and 0.6% hydroprene product was applied to apartments at a rate of 6 fl. oz. product per apartment (1 g hydroprene/apartment). Twenty apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 8 months. Apartments were retreated at 5 months post application. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 86% or less before retreatment at 5 months and over 90% after retreatment. This study does not support efficacy claims for the proposed product because the study tested a product containing permethrin, and efficacy was less than 90% before retreatment.

Study TR-1127: This study was a field study where a 0.25% permethrin and 0.6% hydroprene product was applied to apartments at a rate of 10 fl. oz. product per apartment (2 g hydroprene/apartment). Sixteen apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 5 months and then at 8, 9, and 11 months. Apartments were retreated at 4 and 10 months post application. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 68% or less before retreatment at 4 months and over 90% after retreatment. This study does not support efficacy claims for the proposed product because the study tested a product containing permethrin, and efficacy was less than 90% before retreatment.

Study TR-1148: This study was a field study where a 1.0% propetamphos and 0.12% r,s-hydroprene product was applied to apartments at a rate of 1 g hydroprene/apartment. Twenty one apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 10 months. Apartments were retreated at 6 months post application. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 68% or less before retreatment at 4 months and over 90% after retreatment. This study does not support efficacy claims for the proposed product because the study tested a product containing propetamphos, and efficacy was less than 90% before retreatment.

Study TR-1188: This study was a field study where a 0.25% permethrin and 0.3% s-hydroprene product was applied to apartments at a rate of 12 fl. oz. product per apartment (1.0 g hydroprene/apartment). Twenty 1000 ft² apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 4 months. Apartments were not retreated. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 88% or less at all time points. This study does not support efficacy claims for the proposed product because the study tested a product containing permethrin, and efficacy was less than 90%.

Study TR-1172: This study was a field study where a 0.11% permethrin and 0.15% s-hydroprene product was applied to apartments at a rate of 26 fl. oz. product per apartment (0.9 g hydroprene/apartment). Twenty one apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 8 months. Apartments were retreated four months after initial treatment. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 68% or less at all time points prior to retreatment. This study does not support efficacy claims for the proposed product because the study tested a product containing permethrin, and efficacy was less than 90% before retreatment.

Study TR-1190: This study was a field study where a 0.25% permethrin and 0.3% s-hydroprene product was applied to apartments at a rate of 12 fl. oz. product per apartment (1.0 g hydroprene/apartment). Twenty six apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 6 months. Apartments were retreated five months after initial treatment. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 75% or less at all time points prior to retreatment. This study does not support efficacy claims for the proposed product because the study tested a product containing permethrin, and efficacy was less than 90% before retreatment.

Study TR-1122: This study was a field study where a 0.2% pyrethrins, 1% PBO, 1% MGK 264, and 0.15% s-hydroprene combination product was applied to apartments at a rate of 12 fl. oz. product per apartment (1 g hydroprene/apartment). Eight apartments were treated. Cockroach populations were evaluated using sticky traps placed in the apartment for 24 hours monthly after treatment for 8 months. Apartments were retreated four months after initial treatment. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations was 86% at one month post-treatment, 90% at 2 months post treatment, 85% at 3 months post treatment and then over 90% for months four and five post-treatment. This study does not support efficacy claims for the proposed product because the study tested a product containing synergized pyrethrins, and efficacy was inconsistent before retreatment.

Study TR-1571: This study was a field study where s-hydroprene was applied using a “point source release device” to apartments at a rate of 1.2 mg hydroprene/ft² (9 point sources) and 1.6 mg hydroprene/ft² (12 point sources). The treatments were replicated 16 times. Cockroach populations were evaluated using sticky traps placed in the

apartment for 24 hours monthly after treatment for 12 months. Apartments were retreated every 3 months during the study. Pre-treatment counts were used for the untreated control. The percent reduction in cockroach populations never reached 90% even with retreatment. This study does not support efficacy claims for the proposed product because efficacy never reached 90%.

Study TR-1571: This was a laboratory study to determine the residual efficacy of a 9% s-hydroprene product applied at rates of 0.33 mg hydroprene/ft², 0.68 mg hydroprene/ft², and 1.4 mg hydroprene/ft² and an untreated control. Masonite panels were treated with each rate and third instar German cockroaches were exposed to treated panels. The lower rates were reapplied monthly and re-inoculated with additional cockroaches. Replication was not provided. The study evaluated wing-twisting as the endpoint for efficacy. In all s-hydroprene treatments 100% of cockroaches exhibited wing-twisting effects after molting. This study does not support efficacy claims for the proposed product because wing-twisting isn't an appropriate endpoint for "kills" or "breaks the lifecycle" claims, the product was reapplied monthly, and the methods were insufficient for adequate evaluation.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims for the proposed product because efficacy is not acceptable, and many of the studies tested products with different active ingredients than the proposed product.

45331609. Residual Efficacy of Chemsico Home Insect Control 3L: German Roaches, Carpenter Ants, and Crickets.

(1) non-GLP

(2) **Methods:** This study tested efficacy of a water based 0.03% lambda-cyhalothrin product applied to 6 x 6 inch vinyl tiles at a rate of 0.8 g product per tile (0.96 mg lambda-cyhalothrin/ft²). German cockroaches and carpenter ants were exposed to the treated tiles for 4 hours and then moved to untreated containers. Speed of knockdown was evaluated at one, two, three, and four hours post exposure to treated tiles. German cockroaches were exposed to treated tiles at one, three, four, five, and six months post application and carpenter ants were exposed at four, five, and six months post application. There were three replicates of ten individuals for German cockroaches and carpenter ants for the treated surfaces and an unknown number of untreated control replicates.

(3) **Results:** Mortality of German cockroaches exposed to treated tiles was 100% for all observation dates and mortality of carpenter ants was 97% or higher at all time points. With regard to speed of kill, 100% of cockroaches were knocked down within one hour of exposure at months 3, 4, 5, and 6. The first month, 100% of cockroaches were knocked down at 2 hours after exposure. There was no mortality of German cockroaches in the control treatment. Over 97% of carpenter ants were knocked down within one hour of exposure at 4, 5, and 6 months post application. No mortality of carpenter ants was observed in the control treatment at 4 and 6 months post application. At the observation 5 months post application 13% mortality of carpenter ants was observed in the control group.

(4) **Conclusion: Supplemental.** This study shows residual efficacy of the product against carpenter ants and German cockroaches on vinyl tile. However, this study cannot by itself support efficacy claims for the proposed product because replication of the treatment is low, replication in the untreated control group is unknown, and the tested rate 0.96 mg lambda-cyhalothrin/ft² is more than twice the lowest labeled rate (1 second per linear ft which is equivalent to 0.42 mg lambda-cyhalothrin product/ft²).

45338401. Evaluation of a Whitmire Micro-Gen Aerosol Formulation (0.500% Lambda-Cyhalothrin) For the Treatment of Red Imported Fire Ant Mounds on Urban Properties in Texas.

(1) non-GLP

(2) **Methods:** This study tested the efficacy of a 0.05% lambda-cyhalothrin aerosol product for efficacy against red imported fire ant mounds in Texas. Ten mounds were treated with the aerosol and ten mounds were not treated with anything (control treatment). An applicator wand was inserted into the mound 6-12 inches between four and eight times for 10 seconds each time depending on the size of the mound. The mounds were also sprayed topically for three seconds after the mound insertion application. Efficacy was determined by assessing fire ant activity

according to the mound disturbance index (scale 0-10 where 10 is greatest activity) prior to application and then comparing it to counts at 30 and 60 minutes, and 1 and 7 days post application.

(3) **Results:** The average index number for mounds in the treatment group prior to treatment was 4.9, while the average index number for the placebo mounds prior to treatment was 5.5. After 7 days, average index number for mound activity in the treatment group was 0, while in the placebo group the average index number was 4.7.

(4) **Conclusion: Unacceptable.** This MRID does not support efficacy claims against fire ants because the treatment rate which appears to be considerably higher than the proposed label rate could not be compared to the label rate (1 second product per linear foot).

45338402. Efficacy of Formula Code: 191-047 in Control of Urban Pests.

(1) non-GLP

(2) **Methods:** This study tested residual efficacy on fiberboard panels of an aerosol product containing 0.05% lambda-cyhalothrin and an untreated control against adult brown dog tick, adult bark scorpions, nymphs and adult German cockroaches, and nymph and adult centipedes. Cockroaches and centipedes were collected from the field. Arthropods were exposed to panels treated with a 1 second burst, equivalent to the following rates: ticks at 5 mg lambda-cyhalothrin/ft²; scorpions at 4.6 mg lambda-cyhalothrin/ft²; German cockroaches at 5 mg lambda-cyhalothrin/ft²; and centipedes on day 0 at 3.2 mg lambda-cyhalothrin/ft², on day 14 post treatment at 4.2 mg lambda-cyhalothrin/ft². There were three replicates of ten individuals for ticks and cockroaches, and five replicates of 1 individual for scorpions and centipedes. Mortality was recorded at 1, 4, 8, and 24 hours post exposure on panels aged for 0 and 14 days.

(3) **Results:** Mortality of ticks was 100% within one hour of exposure to panels at 0 days after treatment and 97% at 4 hours after exposure to tiles aged for 14 days after treatment. Mortality of scorpions was 100% within one hour of exposure to treated panels at 0 days after treatment, but on panels aged for 14 days mortality was 100% at 4 hours after exposure but only 60% at 24 hours after exposure indicating that moribund individuals were included in mortality counts. Mortality of German cockroaches was 100% within one hour of exposure on treated panels at 0 days post treatment, but on treated panels aged for 14 days mortality was 87% at 24 hours post exposure. Mortality of centipedes on treated panels at 0 and 14 days post treatment was 80% at 8 hours post exposure but control mortality was 20%. Mortality in control treatment was acceptable for ticks, scorpions and German cockroaches.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims against ticks, scorpions, German cockroaches, or centipedes for the proposed product because replication was too low, moribund and dead arthropods were not separated, efficacy against scorpions and German cockroaches on panels aged for 14 days was not acceptable, and mortality of centipedes did not reach 90% before control mortality exceeded 10%. In addition, adults should be tested for cockroaches and centipedes and the tested application rates were higher than the highest labeled application rate (1.3 mg lambda-cyhalothrin/ft²).

45477802. Efficacy of Hydroprene Formulations: A Public Literature Search.

(1) non-GLP

(2) **Methods and Results:** This MRID is a compilation of 12 published manuscripts each of which are summarized individually below.

Study 1: Comparative sterilizing and ovicidal activity of fenoxycarb and hydroprene in adults and oothecae of the German cockroach (Dictyoptera: Blattellidae): This manuscript documents the effects of topical application of a 96% hydroprene formulation dissolved and diluted to 1 and 10 µg/µl solutions on German cockroaches. One µl of a solution was applied ventrally to German cockroaches. German cockroaches were evaluated at four different life stages: 1-2 day old virgin females and males; 4-5 week old fertilized females; and 1 week old females carrying newly protruded oothecal. Male cockroaches were only tested using the higher concentration. Each treatment was tested using three replicates of 10 cockroaches. Regardless of what life stage of

cockroach was tested the percent of infertile cockroaches, and percent of oothecae hatching was never reduced by more than 30%. Because the treatment dose cannot be compared to the label rate, and efficacy of hydroprene was never better than 30% for any measured endpoint, this study does not support any efficacy claims for the proposed product.

Study 2: Sensitive developmental period of last-instar German cockroaches (Dictyoptera: Blattellidae) to Fenoxycarb and hydroprene: This manuscript documents the effects of topical application of a 96% hydroprene formulation dissolved and diluted to 10 µg/µl solutions on last instar male and female German cockroaches. One µl of a solution was applied ventrally each cockroach. Control nymphs were treated with acetone. Each treatment was made to cockroaches aged 1, 3, 6, and 9 days post eclosion into the last instar stage. There were three replicates of each treatment containing twenty (10 male and 10 female) German cockroaches each. After treatment, nymphs were held individually in petri dishes and observed for eclosion. Male and female cockroaches surviving to adulthood were mated with untreated, virgin adults and monitored during two ovarian cycles for oothecal production, hatching or abortion of oothecae, and the number of nymphs per viable oothecae. Treatment of cockroaches with hydroprene resulted in less than 5% mortality of last instar cockroaches. When treated female cockroaches were mated with untreated male virgins, the number of progeny produced per ovarian cycle in the hydroprene treatment was reduced by 69% for cockroaches treated 1 day post eclosion, 91% for cockroaches treated 3 days post eclosion, 65% for cockroaches treated 6 days post eclosion, and 20% for cockroaches treated 9 days post eclosion. When treated male cockroaches were mated with untreated female virgins, the number of progeny produced per ovarian cycle in the hydroprene treatment was reduced by 100% for cockroaches treated 1 day post eclosion, 98% for cockroaches treated 3 days post eclosion, 82% for cockroaches treated 6 days post eclosion, and 18% for cockroaches treated 9 days post eclosion. This study is supplemental. This study shows effects on cockroach reproduction after a direct treatment with hydroprene; however, the dose used in the study cannot be directly compared to the label rate, and the effect is inconsistent and dependent on the sex of the cockroaches. Therefore this study cannot by itself support any claims for the proposed product.

Study 3: Morphogenetic effects of hydroprene on German cockroaches (Orthoptera: Blattellidae): This study evaluated the effect of hydroprene on growth and development on male first instar German cockroaches continuously exposed from the time of treatment through adult emergence to panels treated with 0.01, 0.05, 0.1, 0.5, and 1.0 µg hydroprene/cm². The study also evaluated continuous exposure to panels treated with 1.0 µg hydroprene/cm² of nymphal cohorts (1-2, 8-9, 15-16, 22-23, and 29-30 day old nymphs) of German cockroaches, and the effects of hydroprene on male cockroach genitalia. The phallomeres and styli were deformed over 90% of the time in first instar cockroaches exposed to the panels treated with 0.1, 0.5, and 1.0 µg hydroprene/cm². The rate of deformation was less than 70% when cockroaches were treated at 23 and 30 days old. This study does not support efficacy claims for the proposed product because cockroaches were continuously exposed to the treatment for their entire life as a nymph which is unrealistic for a real-world setting for a crack and crevice aerosol type product.

Study 4: Comparative contact activity and residual life of juvenile hormone analogs used for German cockroach (Dictyoptera: Blattellidae) control: This study tested the efficacy of hydroprene on stainless steel, Masonite hardboard, and unpainted plywood surfaces. Treated panels were aged in greenhouses for 1 day, 1, 2, 3, and 4 months at 45°C with UV radiation to assess the persistence of hydroprene. A 9.0% hydroprene product was applied to 10.2" x 10.2" surfaces at a rate of 1 gal product/1000 ft² (approximately 0.34 g hydroprene/ft²). Each treatment and aging period was conducted with three replicates of 15 cockroaches each. Efficacy was evaluated by observing deformation effects such as wing twisting on cockroaches that survived to adulthood. Cockroaches that did not emerge as adults were counted as dead. While high levels of wing twisting were observed, mortality was less than 10% for all treatments on all surfaces for all aging durations. This study does not support any efficacy claims because wing twisting is not an endpoint that may be used to support efficacy claims and mortality was less than 10%.

Study 5: Influence of hydroprene on German cockroach (Dictyoptera: Blattellidae) populations in public housing: Hydroprene foggers were tested in low-income housing apartments. A minimum pretreatment count of over 20 cockroaches was necessary to qualify an apartment for inclusion in the study. Initially 17-23 apartments were treated with each hydroprene treatment. Cockroaches were captured in sticky traps after treatment and evaluated for twisted wings; a common effect caused by hydroprene. Four different hydroprene treatment regimens

were evaluated. Hydroprene foggers (1.2% or 0.6% hydroprene) were applied at 56.7 g product/28.8 m³ (0.17 g product/3 ft³) and each treatment was supplemented with an additional application of propetamphos. In addition, three of the treatment regimens included retreatment with hydroprene at 3 months post initial application. Post-treatment counts were made at 1, 2, 3, 6, and 12 months. Hydroprene never reduced visual counts of German cockroaches by more than 75% except for one treatment regimen at 2 months post application. The percentage of adults displaying twisted wing characteristics was less than 70% except for one time point for one treatment regimen. The percentage of cockroach populations observed as nymphs was never greater than 75% in any of the treatment regimens. This study does not support efficacy claims for the proposed product because efficacy was never above 80% and was typically between 60-75%, propetamphos was also used, and most regimens involved retreatment at three months after initial treatment.

Study 6: Effects of hydroprene exposure on the physiology and insecticide susceptibility of German cockroaches (Orthoptera: Blattellidae): This study assessed the effect of continual exposure of German cockroaches to residual deposits of 1.0 µg hydroprene/cm² (0.1% hydroprene) on body mass, percent body water, dry weight, body constituents (carbohydrates, lipids, and uric acid). The study also included a dose response experiment assessing the effects of 0.1%, 0.05%, 0.01%, 0.005%, and 0.001% hydroprene concentrations on cockroach live weight, body water, and dry weight. While the study showed that cockroaches dosed with the 0.1% hydroprene concentration were larger than unexposed cockroaches, the endpoints are not acceptable to support efficacy claims for the proposed product.

Study 7: Hydroprene effects on the dynamics of laboratory populations of the German cockroach (Dictyoptera: Blattellidae): This study tested a 0.26% hydroprene solution applied to Masonite panels at a rate of 3.78 ml/929 cm² (9.8 mg lambda-cyhalothrin/cm²) against German cockroaches in the laboratory. Large populations of cockroaches were established in 1.8-liter tubs. Treated panels were introduced into tubs to expose cockroaches at week 11 post study initiation, at week 15 and 19 post study initiation, tiles were retreated with a 2.6% dilution of hydroprene. Hydroprene did not have any effects on the populations of German cockroaches until week 17, two weeks after the second application. This study does not support efficacy claims for the proposed product because reapplication was necessary to see an effect indicating that a single application does not work, and the reapplication was applied at a higher dilution than on the proposed label.

Study 8: Elimination of a population of the Oriental cockroach (Dictyoptera: Blattidae) in a simulated domestic environment with the insect juvenile hormone analog (S)-hydroprene: This study tested the efficacy of doses ranging from 5.1 to 9.9 mg hydroprene/m² against oriental cockroaches in large shipping containers. Efficacy was evaluated by measuring cockroach populations, and the number and viability of treated oothecae. Containers were treated at 10 weeks after study initiation with a total release aerosol fogger containing s-hydroprene or propellant only to target an application rate of 25 mg/m². Containers were retreated with the same rate at 6, 13, and 21 months post study initiation. For the first six months after treatment, cockroach population increased in both the hydroprene treated and carrier control containers. While the cockroach populations in the hydroprene treated containers increased for six months, there were about 25% fewer cockroaches in the treated containers than the propellant only containers. After the first retreatment, cockroach populations in the treated containers began to dramatically decline and continued to decline after subsequent retreatment to approximately 10% of the population seen in the containers treated with propellant only. When oothecae were evaluated, there was no reduction in the numbers of oothecae collected until 8 months post study initiation (after the retreatment at 6 months post initial treatment) at which point no oothecae were collected from treated cockroaches. Oothecae were collected from cockroaches in the propellant control treatment throughout the duration of the study. From month 1 through 7 similar numbers of oothecae were collected when compared to the control, although the number of oothecae collected from cockroaches exposed to hydroprene that hatched was reduced by between 30-40% depending on the month. This study does not support efficacy claims for the proposed product because cockroach populations were only reduced by about 25% when compared to the control populations, populations continued to rise after initial treatment, treated cockroaches produced similar numbers of oothecae and the numbers of oothecae that hatched were only reduced by about 30%.

Study 9: Morphogenetic effects of hydroprene on genitalia of the Oriental cockroach (Dictyoptera: Blattidae): This study evaluated the effects on cockroach genitalia of 0.13% (13.6 µg hydroprene/µl) and 0.26% (27.3 µg hydroprene/µl) hydroprene dilutions applied directly to early and late-instar Oriental cockroach nymphs and also to

a plywood panel placed in each colony. There were also two control groups. This study shows that exposure to hydroprene causes genital malformations in both male and female cockroaches. However, the effect these malformations have on the ability of cockroaches to reproduce is not evaluated. This study does not support efficacy claims for the proposed product because genital malformation is not an adequate endpoint to support efficacy claims without confirmatory data showing that cockroaches are unable to reproduce.

Study 10: Effects of hydroprene on development and reproduction in the Oriental cockroach, *Blatta*

orientalis: This study tested the effects of four hydroprene rates, 10, 25, 50, and 100 mg/m² (equivalent to 0.92, 2.32, 4.65, and 9.29 mg lambda-cyhalothrin/ft²) applied to vinyl floor tiles on the ante-penultimate and last instar Oriental cockroaches. Cockroaches were exposed continuously for the duration of the life as a nymph and removed from the treated tanks when they emerged as adults. Cockroaches were assessed for mortality and their ability to produce viable oothecae, and population growth after removal. Mortality of treated cockroaches was less than 10% in all treatments. In the 10 mg/m² treatment, 90% of female cockroaches exposed during the last instar stage produced oothecae and of those, 57% hatched and produced 12.8 nymphs per ootheca; at the higher doses no viable oothecae were produced. When female nymphs were exposed at an earlier nymphal stage, less than 10% of females exposed to any rate produced oothecae and none of the oothecae produced hatched. The fertility of males showed similar effects for younger nymphs, although males exposed to all treatment rates during the last instar fertilized between 10-33% oothecae that were viable. Long-term population growth for cockroaches treated with the 10 mg/m² rate was equal to or exceeded the control treatment; however, cockroach populations were greater than 90% lower when treating with the higher rates at 18, 30 and 50 weeks post treatment. Although this study shows high levels hydroprene efficacy against Oriental cockroaches, this study is unacceptable and does not support efficacy claims because continuous exposure for the period it takes a cockroach to complete a full instar stage is highly unlikely for an aerosol type of product labeled for crack and crevice and void use.

Study 11: Residual effectiveness of insect growth regulators applied to carpet for control of cat flea

(Siphonaptera: Pulicidae) larvae: This study tested pyriproxyfen, fenoxycarb, and methoprene against cat fleas. Because none of these active ingredients are found in the proposed product, this study was not reviewed further.

Study 12: Activity of novel juvenoids on arthropods of veterinary importance: This study tested efficacy of hydroprene against cat fleas, however the methods are wholly inadequate to evaluate this study to support efficacy claims thus an in depth review of this study was not conducted.

(4) **Conclusion: Supplemental.** Some studies in this MRID show physical effects of hydroprene on cockroaches; however, no combination of studies in this MRID is adequate to support any efficacy claims for the proposed product a variety of reasons outline within each study above.

45667203. Performance of Chemsico RTU Insecticide L Against House Flies, Subterranean Termites, American Cockroaches, German Cockroaches, Deer Ticks, House Crickets, Mosquitoes, Black Carpenter Ants, Harvester Ants, Red Carpenter Ants, and Cat Fleas.

(1) non-GLP

(2) **Methods:** This study tested the efficacy of a direct spray with 3 g of a 0.002% lambda-cyhalothrin product (6 mg lambda-cyhalothrin/replicate) against German and American cockroaches, red and black carpenter ants, cat fleas, and harvester ants. For each species tested there were three replicates of between 8-10 individuals per replicate. Insects were sprayed in petri dishes and immediately transferred to clean containers and evaluated for the KT₅₀. At 24 hours post treatment, mortality of all insects was evaluated. There was no control treatment included in the study.

(3) **Results:** At 24 hours post treatment, mortality was 100% for all species tested (German and American cockroaches, red and black carpenter ants, cat fleas, and harvester ants).

(4) **Conclusion: Unacceptable.** This study does not support any efficacy claims for the proposed product because no control treatment was included, and replication was marginal.

45719001. Evaluation of Gentrol for Efficacy against Bed Bugs.

(1) non-GLP

(2) **Methods:** This study tested the efficacy of an untreated control and a Gentrol product (assumed to contain an unknown percentage of S-hydroprene) against bed bugs. The level of insecticide resistance for the strain was not provided. Five replicates of 20 mid to late instar bed bug nymphs were exposed to wood discs treated with a dilution of 1 part Gentrol to 128 parts of water by volume applied at a rate of 1 gallon/1500 ft². Bed bugs were exposed continuously until the bed bugs in the control treatment produced an F₁ generation.

(3) **Results:** The average number of eggs produced by bed bugs in the treated containers was 30.6, a 67% reduction when compared to egg production in the control treatment. The average number of bed bug nymphs present in the group treated with hydroprene was 15.2, a 71% reduction when compared to the control treatment. The average number of bed bugs that eclosed into adults in the treated containers was 15.6 vs. 18 in the control treatment. The other bed bugs in the treated group are unaccounted for and are assumed to be dead.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims for the proposed product because the active ingredient and percent of active were not provided, the product is diluted in an aqueous form whereas the proposed product is an aerosol, and the number of eggs and nymphs were only reduced by 67% and 71% respectively. Moreover, there are insects unaccounted for and the numbers of adults in the treated and untreated groups is similar.

45730901. Residual Product Performance of Chemsico Home Insect Control 3L Against Male German Roaches, Black Carpenter Ants, House Crickets and Cat Fleas.

(1) non-GLP

(2) **Methods:** This study tested vinyl floor tiles with residual deposits of a 0.03% lambda-cyhalothrin product at a rate of 2.8 g product/ft² (1.4 mg lambda-cyhalothrin/ft²) against German cockroaches, black carpenter ants, and cat fleas. German cockroaches were exposed for four hours to surfaces aged 0, 5, 7, and 9 months after product application. Carpenter ants and fleas were only exposed to tiles aged for 9 months. There were fifteen replicates of 10 individuals for each insect species for the lambda-cyhalothrin treatment for each aging period and three replicates of 10 individuals for the control treatment. Mortality was assessed at 24 hours post exposure for all species.

(3) **Results:** There was no mortality of German cockroaches and fleas in the control treatments. Mortality of carpenter ants in the control treatment was 13%. Mortality of cockroaches and ants exposed to treated tiles was 100% for all observations, and mortality of fleas exposed to treated tiles was 92%.

(4) **Conclusion: Partially Acceptable.** This study by itself supports claims of kills German cockroaches for up to 9 months at the rate of 1 second/ft² (approximately 1.3 mg lambda cyhalothrin/ft²) and in conjunction with MRID 45331609 supports claims of kills carpenter ants for up to 9 months. Because cat fleas were only tested at 9 months post application, additional data are needed to confirm efficacy of the product against cat fleas and therefore efficacy claims against fleas are not supported by this MRID. This study does not support efficacy claims for the proposed product at the lowest labeled rate of 0.42 mg lambda-cyhalothrin/ft².

45862901. Evaluation of Residues of Lambda-Cyhalothrin Compared to D-Force HPX in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Larvae, and Field Cricket.

(1) non-GLP

(2) **Methods:** This study tested efficacy of a residual application of an untreated control and 0.05% lambda-cyhalothrin aerosol product against a mix of nymphs and adults of German and American cockroaches on tile and wood surfaces. The product was applied to tiles at a rate of 14.9 g product/ft² (7.46 mg lambda-cyhalothrin/ft²) for

German cockroaches and 13.43 g product/ft² (6.7 mg lambda-cyhalothrin/ft²) for American cockroaches and to particle board at a rate of 12 g product/ft² (6 mg lambda-cyhalothrin/ft²) for both German and American cockroaches. There were four replicates of five individuals for both cockroach species. Surfaces were aged for 1, 14, and 28 days after application. Cockroaches were assessed for knockdown and mortality at 1, 4, and 24 hours and exposed to treated tiles continuously.

(3) **Results:** Mortality in the control treatment was less than 10% for both species on both surfaces at all time points. The percentage of dead German cockroaches was greater than 90% after 1 hour of exposure to treated tiles aged for 1, 14, and 28 days. On treated wood surfaces aged for 1 day, mortality of German cockroaches did not reach 90% even after 24 hours of continuous exposure. On treated wood surfaces aged for 14 days, mortality of German cockroaches was 100% after 4 hours of exposure, and on surfaces aged for 28 days 90% mortality was reached after 24 hours of continuous exposure. The percentage of dead American cockroaches was 100% after a four hour exposure to treated tiles aged for 1, 14, and 28 days after application. The percentage of dead American cockroaches was 95% or greater after a four hour exposure to treated wood surfaces aged for 1, 14, and 28 days after application.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims because the tested application rates are higher than the label rate (0.42 – 1.3 mg lambda cyhalothrin/ft²), adults should be tested, replication was insufficient, and efficacy against German cockroaches on wood substrates was inconsistent and inadequate without a 24 hour forced exposure period.

45862902. Evaluation of Experimental Insecticide Formula 215-006, Compared to D-Force HPX in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour beetle, Indian Meal Moth Adult, Indian Meal Moth Larvae, Paper Wasp, Western Yellowjacket, Honey Bee, House Fly, Stable Fly, bed Bug, European Earwig, Silverfish, and Field Cricket.

(1) non-GLP

(2) **Methods:** This study tested a direct application of a 0.05% lambda-cyhalothrin aerosol product against bed bugs (1 g product/replicate; 0.5 mg lambda-cyhalothrin/replicate), German (1 g product/replicate) and American cockroaches (1.3 g product/replicate; 0.65 mg lambda-cyhalothrin/replicate). There were four replicates of five individuals for both cockroach species and four replicates of ten individuals for bed bugs for each treatment. Information about the bed bug strain and any resistance to pesticides was not provided. Cockroaches and bed bugs were transferred to clean containers immediately after application. Mortality was assessed at 0.5, 1, 2, 3, 5, 10, and 15 minutes post treatment.

(3) **Results:** Within 15 minutes of application, 100% of treated bed bugs, German cockroaches, and American cockroaches were dead. There was no control mortality of bed bugs, or German or American cockroaches.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims by itself because mortality was defined as inability to upright and maintain coordinated movement and dead insects were not recorded, replication is too low for both cockroach species, the tested bed bug strain was not provided, and the untreated control treatment is not described although mortality data are provided.

46097402. Efficacy Evaluations of TC-241 (0.05% Lambda-cyhalothrin) Against Selected Arthropod Pests *in Vitro*.

(1) non-GLP

(2) **Methods:** This study tested efficacy of a direct spray of a 0.05% lambda-cyhalothrin product against cat fleas and carpenter ants (*Camponotus modoc*). The product was applied for a 1 second burst directly to the insects which equated to 1.9 g product (0.95 mg lambda-cyhalothrin) per replicate container (1 quart jar) for fleas and 2.4 g product (1.2 mg lambda-cyhalothrin) per replicate container (1 pint cup) for carpenter ants. There were five replicates of ten individuals for cat fleas and five replicates of five individuals for carpenter ants. Insects were not transferred to clean containers after application. Insects were evaluated for “knockdown mortality” at one hour post

treatment and mortality at 24 hours post treatment.

(3) **Results:** At one hour post application, knockdown mortality of carpenter ants and cat fleas was 100%. Mortality of both insect species at 24 hours post application was 100%. Control mortality was less than 10%.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims for the proposed product against fleas or carpenter ants because they were continuously exposed to the treatment, replication of ants was not adequate, and knockdown and mortality were not differentiated at 1 hour post application so we could not determine how many ants were dead after a 1 hour exposure. Also, a rate of 1.2 mg lambda-cyhalothrin/container is at least three times the lowest labeled rate (0.42 mg lambda-cyhalothrin per linear ft) and equivalent to the highest labeled rate.

46209304. Thermal Point Source Efficacy: (S-Hydroprene): Final Report.

(1) GLP

(2) **Methods:** This study tested the efficacy against German cockroaches of an untreated control, a single treatment of 0.3 mg/ft² of S-hydroprene using a thermal point source to volatilize the active ingredient, and an initial treatment of 0.3 mg/ft² of S-hydroprene followed by monthly retreatment (for an unknown number of months at a rate of 0.22 g product per chamber). Cockroaches were confined to containers with either vinyl or ceramic tiles. Each treatment was replicated in three chambers with three replicates of ten 3rd-4th instar cockroaches for each surface type for each treatment. In the all three treatment groups some containers were sprayed when empty and cockroaches were placed into treated containers at 2, 4, and 6 weeks post initial application. There were three replicate containers for each substrate that contained cockroaches that were sprayed during the initial application of each treatment as well. Observations were made for cockroach mortality, IGR type deformities, presence of oothecal, and a hatching F₁ generation.

(3) **Results:** In all treatments for all exposure periods over 90% of nymphs eclosed into adult cockroaches. In the groups treated with a single application of hydroprene for both surface types, the number of containers producing an F₁ generation was reduced by 78% for the group treated at the initial application, 89% for the group exposed to surfaces aged 2 weeks, and 45% for the groups exposed to surfaces aged for 4 and 6 weeks when compared to the control treatment. The reduction was similar for each surface type individually. The numbers of oothecae produced by the group were reduced by between 20% and 90% in the group treated with a single application of hydroprene when compared to the control treatment. The reduction was between 75-90% for cockroaches exposed to the initial treatment and then gradually decreased for cockroaches exposed to residual deposits at 2, 4, and 6 weeks post initial application. The presentation of the data does not allow the reviewer to make inferences about the number of oothecae in the treated groups that contain viable eggs. Because the product was reapplied monthly, data from the third group are irrelevant.

(4) **Conclusion: Unacceptable.** This study does not support claims for the proposed product because the reduction in the number of treated containers with cockroaches producing an F₁ generation was not reduced by 90%, all nymphs molted into adults, and the reduction in the number of oothecae produced was highly variable and the number of viable oothecae was unclear. In addition, while the rate is likely to be lower than the proposed label rate, one treatment group required retreatment, and the product was applied using a thermal point source to volatilize the product which is a completely different application process and formulation than the aerosol spray on the proposed label.

49777512. Evaluation of Gentrol Aerosol for Efficacy against Bed Bugs.

(1) non-GLP

(2) **Methods:** This study tested the residual efficacy of Gentrol® aerosol (registrant confirmed test product was EPA Reg. No. 2724-484 which contains 0.36% hydroprene) against bed bugs. Bed bugs were not identified with regard to life stage or resistant or susceptible strain. The product was applied to 3-inch diameter wood discs at a rate of 0.022 g product per disc (0.45 g product/ft²) for four discs and 0.019 g product per disc (0.39 g/ft²) for a fifth disc. The targeted application rate was 0.02 g product per disc. Discs were removed after 14 days, retreated, and placed

back into holding containers until one week after an F₁ generation was observed in control replicates. When discs were removed on day 14, bed bugs were anesthetized with CO₂ and kept in the containers. The study does not indicate if bed bugs in the control treatment were also anesthetized on day 14. Each treatment was replicated five times with 20 bed bugs. Bed bugs were observed for survival and maturation weekly until the control replicates show an F₁ generation. The number of bed bugs in each life state at the conclusion of the experiment was also recorded. Nymphs which were unaccounted for in the control treatment were dead, but it is not indicated if individuals which were unaccounted for in the Gentrol group were dead.

(3) **Results:** In the control treatment 77% of nymphs emerged into adults and the other 23% of nymphs died. In the Gentrol treatment group, 27% of nymphs emerged into adults, while 7% remained in the nymph stage. In the group treated with hydroprene, the 66% of individuals unaccounted for were most likely dead. Adults in the control treatment produced an average of 85 eggs per container, while eggs were only produced in the one hydroprene replicate that was treated with 0.019 g product.

(4) **Conclusion: Unacceptable.** This study does not support efficacy claims for the proposed product because retreatment with hydroprene was required, hydroprene only prevented 73% of nymphs from emerging as adults, the bed bug life stage and strain and resistance status of the strain were not identified, control mortality was 23% which too high.

IV. EXECUTIVE DATA SUMMARY:

(A) The submitted data (combination of MRIDs 45331609, 45730901) support claims of kills/controls German cockroaches and carpenter ants for up to 9 months at the rate of 1.3 mg lambda-cyhalothrin/ft² for crack and crevice and spot treatments.

The submitted data do not support insect growth regulator claims against cockroaches or any other public health pests. The data also do not support claims of kills ants, bed bugs, fire ants, harvester ants, American cockroaches, or a claims of “cockroaches”, fleas, and spiders. The data submitted do not support the labeled void treatment rate against public health pests because surface deposition during a void application (application by volume) is going to be lower on an area basis because deposition will occur on walls in addition to the floor surface. Therefore the rates tested in the studies above do not translate to the void treatment rate on the proposed label.

V. LABEL RECOMMENDATIONS:

(1) **On page 2 in the first line of the section GENERAL INFORMATION:** delete the words “provides effective kill” and replace with “kills”. Modify the public health pests in the pest list according to the first claim under the acceptable claims section below.

On page 3 in the first paragraph: remove all public health pests (e.g., cockroaches and bed bugs) from any IGR language found in this paragraph.

On page 3 under application method: indicate that the higher rate (1 second per linear foot) needs to be used for German cockroaches and carpenter ants. Modify the language around the lower rate to say except for German cockroaches and carpenter ants. Modify the language for void treatments to indicate that void treatments are only for the non-public health pests listed on the label.

On page 4 under General pest control: Modify “ants” to include the exclusion (excluding fire ants, pharaoh ants, harvester ants), change “cockroaches” to “German cockroaches”, modify spiders to include the exclusion (except black widow and brown recluse spiders), and remove the section regarding bed bugs.

(2) The following marketing claims are acceptable:

A broad spectrum insecticide that kills ants (excluding fire ants, pharaoh ants, harvester ants), carpenter ants, German cockroaches, spiders (except black widow and brown recluse spiders)

Contains an adulticide and IGR

Kills German cockroaches-ants (excluding fire ants, pharaoh ants, harvester ants)-carpenter ants for up to 9 months

Kills hidden cockroaches
Combination of adulticide and IGR

(3) The following marketing claims are unacceptable:

Provides quick killing action

Long residual control with the IGR

Kills fleas-cockroaches-ants

Kills by contact-Kills fast

IGR controls roaches for 3-4 months

Breaks the lifecycle of listed pests

A broad spectrum insecticide highly effective... (see section on acceptable claims for new wording)

(4) The following MRIDs should be removed from the data matrix, as they are classified as “unacceptable” to support the product: 45477701, 49777511, 11019, 160261, 40263301, 44535509, 45338401, 45338402, 45477802, 45667203, 45719001, 45862901, 46209304, 49777512, 46097402, 45862902.

(5) Note to PM/Reviewer: Claims referencing pest species/groups above are only applicable to the public health pests. The label contains pests that are not of public health concern and they are not covered in this review.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 000110-19. Alkyl 3, 7, 11-Trimethyldodeca-2, 4-dienoates, A New Class of Potent Insect Growth Regulators with Juvenile Hormone Activity. Henrick, C.A., Staal, G.B., Siddall, J.B. [No date.]

OCSPP Product Performance Guideline: 810.3600

**Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044**

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{AB}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{AB}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{AB}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600
MRID:	000110-19. Alkyl 3, 7, 11-Trimethyldodeca-2, 4-dienoates, A New Class of Potent Insect Growth Regulators with Juvenile Hormone Activity. Henrick, C.A., Staal, G.B., Siddall, J.B. [No date.]
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Not provided
TESTING FACILITY:	Research Laboratory, Zoecon Corporation, Palo Alto, CA 94304
STUDY DIRECTOR or INVESTIGATOR:	Not provided
SUBMITTER:	Not provided
STUDY COMPLETED:	Unknown
CONFIDENTIALITY CLAIMS:	Not specified
GOOD LABORATORY PRACTICE:	Not specified
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

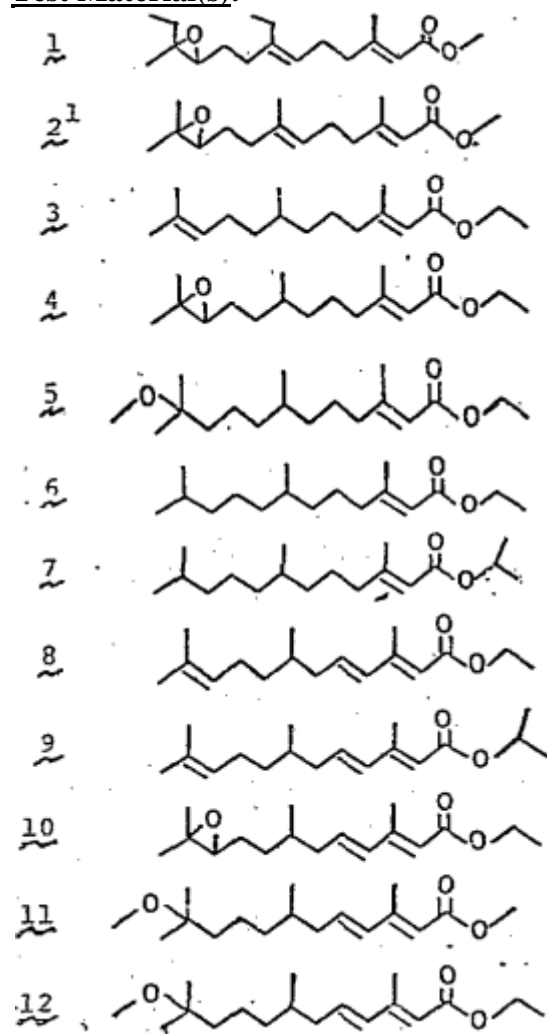
Title: Alkyl 3, 7, 11-Trimethyldodeca-2, 4-dienoates, A New Class of Potent Insect Growth Regulators with Juvenile Hormone Activity.

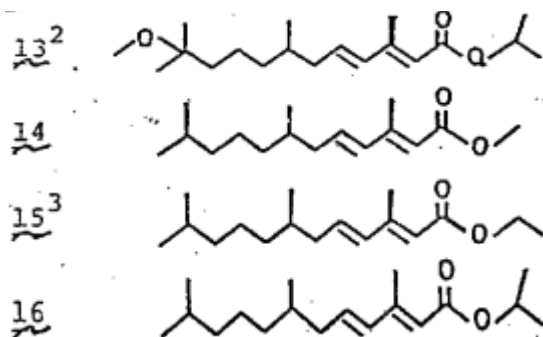
Purpose/Objective:

embryogenesis. We wish to report the discovery of a new class of IGRs (alkyl 3,7,11-trimethyldodeca-2,4-dienoates) whose efficacy has been demonstrated in large scale field tests.

Materials and Methods

Test Material(s):





1 microliter of acetone solution containing 100, 10, 1, 0.1, 0.01 or 0.001 microgram of each compound was applied to the mouthparts of greater wax moth pupae and to the ventral surface of yellow mealworm pupae.

50 microliters of each test solution was added to 50 ml water for assays against yellow fever mosquito, but the concentration of the added solution was not given, therefore a.i. rate could not be determined.

Lambda-Cyhalothrin, one of the compounds on the product label, is not tested in this study. Compound 15 is identical in structure to (S)-Hydroprene and is assumed to be S-hydroprene.

Test Location: Palo Alto, California

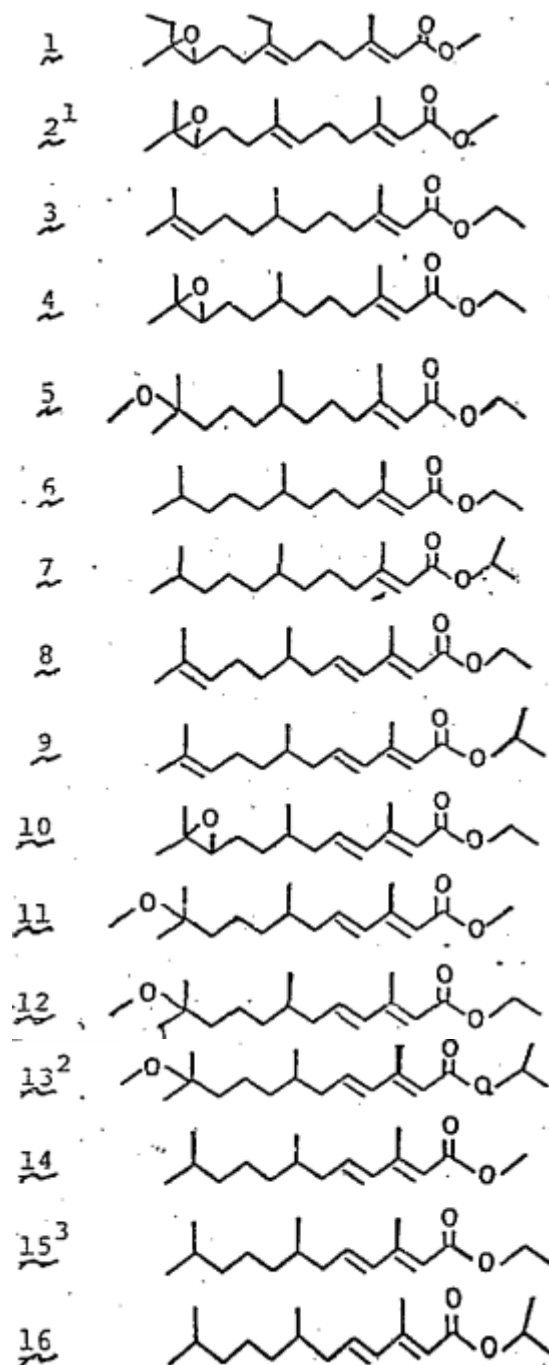
Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. Greater wax moth, *Galleria mellonella*; yellow meal worm, *Tenebrio molitor*; yellow fever mosquito, *Aedes aegypti*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Greater wax moth: pupae less than 24 hr old; yellow meal worm: pupae less than 24 hr old; yellow fever mosquito: last larval instars, started as 4th instar larvae
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains. Mass reared colonies
- If female adults are used - are they gravid? NA; pupae and larvae used
- Describe rearing techniques. Not reported for greater wax moth and yellow meal worm, maintained on liver meal at 28 °C for yellow fever mosquito.

Experiment description:

- List the treatments including the untreated control.



1 microliter of acetone solution containing 100, 10, 1, 0.1, 0.01 or 0.001 microgram of each compound was applied to the mouthparts of greater wax moth pupae and to the ventral surface of yellow mealworm pupae.

50 microliters of each test solution was added to 50 ml water for assays against yellow fever mosquito, but the concentration of the added solution was not given but the concentrations are assumed to be the same as those for the wax moth pupae and mealworm pupae.

Untreated control replicates are not described or reported.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

Greater wax moth:

larvae was employed to produce highly synchronous pupation. One μ l of acetone solution containing 100, 10, 1, 0.1, 0.01, or 0.001 μ g of compound was applied to the mouthparts of each test pupa. Treated pupae were allowed to develop for 10 days at 31°C and then scored for both retention of pupal characters and adult emergence. For the retention of pupal characters, the

Yellow meal worm:

B. Yellow mealworm (Tenebrio molitor) pupae. Fresh pupae (within 24 hours) were collected and treated on the ventral surface with 1 μ l acetone solution of the test compound. The treated pupae were evaluated after 10 days at 25°C for retention of such pupal characters as unpigmented cuticle, urigomphi, gin traps, and genitalia, using a graded score ranging from 0 to 4 (Bowers, 1968). The results were expressed and plotted as in A.

Yellow fever mosquito:

instars. Fourth larval instars were selected from colonies maintained at 28°C on a diet of liver powder. Three replicates of 10 larvae each were transferred to disposable styrene tumblers containing 50 ml of tap water. Acetone solutions of test compounds were then added to the cups (50 μ l per 50 ml water) and liver powder was added as food. No difference in

- Method(s) of application: Topical application (greater wax moth and yellow meal worm), aquatic treatment (yellow fever mosquito)

- Number of replicates per treatment: Not reported for greater wax moth and yellow meal worm, 3 for yellow fever mosquito
- Number of individuals per replicate: Not reported for greater wax moth and yellow meal worm, 10 for yellow fever mosquito
- Length of exposure to treatment (time in seconds, minutes or hours): Greater wax moth and yellow meal worm: 10 days, 5 days for yellow fever mosquito
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): Greater wax moth: 31 °C, yellow meal worm: 25 °C, yellow fever mosquito: 28°C
- The type of harborage if used in the experiment: Not applicable
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

adult emergence. For the retention of pupal characters, the following scoring system was used:

0 = normal adult;

1 = minor pupal rudimentary mandibles only;

2 = as in 1, but also pupal cutical patches at the base of the proboscis;

3 = extensive pupal cuticle formation at base of proboscis, slight pupal characters in intersegmental membranes in legs;

4 = proboscis entirely pupal, larger than normal, legs with extensive pupal zones;

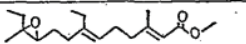
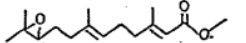
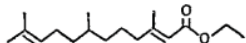
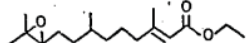






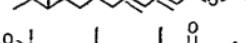
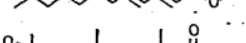
5 = merging pupal bands on legs, specimen with only a few adult setae, essentially "a second pupa."

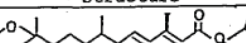
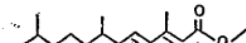
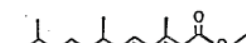

The graded-response score was calculated as a percentage of the maximum attainable ($n \times 5$) and plotted against the dose on semi-logarithmic paper. The ID_{50} dose is taken from the intersection of this plotted line with the 50% effect level.

- Report if morbidity and mortality were recorded separately: NA; mortality was not measured
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

TABLE I. ID₅₀ VALUES AND RELATIVE POTENCIES ON SENSITIVE SYNCHRONIZED INSTARS

	Structure	Aedes aegypti ppm	Relative Potency	Galleria mellonella µg/pupa	Relative Potency	Tenebrio molitor µg/pupa	Relative Potency
1		0.15	1.0	0.050	1.0	0.13	1.0
2 ¹		0.34	0.44	9.8	0.0051	7.8	0.017
3		0.57	0.26	32	0.0016	28	0.0046
4		0.42	0.36	2.5	0.020	20	0.0065
5		0.040	3.8	40	0.0013	85	0.0015
6		0.058	2.6	1.0	0.050	3.3	0.039
7		0.023	6.5	>100	<0.0005	0.54	0.24
8		0.30	0.5	0.45	0.11	7.8	0.017
9		0.070	2.1	9.0	0.0056	0.42	0.31
10		0.18	0.8	0.86	0.058	34	0.0038
11		0.02	7.5	0.082	0.61	36	0.0036
12		0.001 ⁷	88	0.074	0.68	8.9	0.015

	Structure	Aedes aegypti ppm	Relative Potency	Galleria mellonella µg/pupa	Relative Potency	Tenebrio molitor µg/pupa	Relative Potency
13 ²		0.000 ¹²	1250	1.1	0.045	0.0061	21
14		0.27	0.6	0.010	5.0	1.3	0.10
15 ³		0.021	7.1	0.040	1.3	0.29	0.45
16		0.001 ²	125	0.28	0.18	0.026	5.0

¹ Bowers et al. (1965); ² ALTOZARTM Insect Growth Regulator (ZR-S15); ³ ALTOZARTM Insect Growth Regulator (ZR-S12).

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Not determinable; 50% values are reported
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): NA
 - Formulation type (e.g. aerosol, granular): Liquid

- Application type (e.g. direct, surface, area): Direct and aquatic
- Timepoints at which corresponding control mortality is greater than 10%: NA; mortality not recorded and control replicates are not described or reported

Conclusions

- Because ID₅₀ values were reported, determination of 90% efficacy levels was not possible.
- Lambda-Cyhalothrin, one of the labeled active ingredients, was not tested in this report.
- Untreated control replicates are not described or reported.
- Information on replications is missing for the greater wax moth and yellow meal worm.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 001602-61. Laboratory Testing of Various Insect Growth Regulators on Three Different Substrates: Glass, Vinyl Tile, and Unpainted Plywood. Rudolph, R. 1986.

OCSP Product Performance Guideline: 810.3600

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{#5}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{#5}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{#5}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600
MRID:	001602-61. Laboratory Testing of Various Insect Growth Regulators on Three Different Substrates: Glass, Vinyl Tile, and Unpainted Plywood. Rudolph, R. 1986.
	This document reports the results of two studies, and several tables from a literature review.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Not provided
TESTING FACILITY:	Zoecon Industries, Research and Development Building, 12200 Denton Drive, Dallas, TX
STUDY DIRECTOR or INVESTIGATOR:	Not reported
SUBMITTER:	Not reported
STUDY COMPLETED:	02/1985
CONFIDENTIALITY CLAIMS:	Not reported
GOOD LABORATORY PRACTICE:	Not reported
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Study 1

Efficacy Study Data Evaluation Record

Title: Laboratory Testing of Various Insect Growth Regulators on Three Different Substrates: Glass, Vinyl Tile, and Unpainted Plywood.

Purpose/Objective:

This study was initiated in an attempt to generate sufficient rate efficacy data on various substrates to separate seven different insect growth regulators vs. German cockroaches, Blattella germanica. The study

Materials and Methods

Test Material(s):

1.	F-240-45-1	0.06%	Hydroprene Fogger*	3oz
2.	F-240-45-2	0.02%	Hydroprene Fogger	3oz
3.	F-240-44-1	0.06%	S-Hydroprene Fogger	3oz
4.	F-240-44-2	0.02%	S-Hydroprene Fogger	3oz
5.	F-240-43-1	0.06%	S-Methoprene Fogger	3oz
6.	F-240-43-2	0.02%	S-Methoprene Fogger	3oz
7.	F-240-42-1	0.06%	Fenoxycarb Fogger	3oz
8.	F-240-42-2	0.02%	Fenoxycarb Fogger	3oz
9.	F-240-40-1	0.06%	ZR-8509 Fogger	3oz
10.	F-240-40-2	0.02%	ZR-8509 Fogger	3oz
11.	F-240-39-1	0.06%	ZR-7922 Fogger	3oz
12.	F-240-39-2	0.02%	ZR-7922 Fogger	3oz
13.	F-240-41-1	0.06%	ZR-8570 Fogger	3oz
14.	F-240-41-2	0.02%	ZR-8570 Fogger	3oz
15.	F-240-46-1	-----	Placebo Fogger	3oz

Each product was applied at a rate of (3 oz = 85 g) 51 mg/3000 cubic feet or 17 mg/3000 cubic feet.

Chemical analysis of cigarette papers placed in the chamber at various distances from the discharge point determined the following a.i. deposition rates:

TREATMENT		R&D ANALYSIS		DEPOSITION $\mu\text{g AI/CM}^2$		
Compound	Rate	R&D No.	% AI	6 Foot	9 Foot	12 Foot
Placebo	1 oz/1,000 ft ³	---	---	---	---	---
Hydroprene	0.06% 1 oz/1,000 ft ³	9839	0.061%	0.034	0.036	0.032
Hydroprene	0.02% 1 oz/1,000 ft ³	9840	0.20%	0.012	0.011	0.011
S-Hydroprene	0.06% 1 oz/1,000 ft ³	9837	0.064%	0.053	0.053	0.038
S-Hydroprene	0.02% 1 oz/1,000 ft ³	9838	0.021%	0.011	0.010	0.005
S-Methoprene	0.06% 1 oz/1,000 ft ³	9835	0.050%	0.058	0.078	0.060
S-Methoprene	0.02% 1 oz/1,000 ft ³	9836	0.021%	0.027	0.025	0.023
Fenoxycarb	0.06% 1 oz/1,000 ft ³	9833	0.06%	0.084	0.076	0.069
Fenoxycarb	0.02% 1 oz/1,000 ft ³	9834	0.02%	0.026	0.026	0.023
ZR-8509	0.06% 1 oz/1,000 ft ³	9829	0.080%	All samples below 0.4 $\mu\text{g}/\text{ft}^2$ the lowest detectable limit.		
ZR-8509	0.02% 1 oz/1,000 ft ³	9830	0.036%			
ZR-7922	0.06% 1 oz/1,000 ft ³	9827	0.06%	0.054	0.052	0.054
ZR-7922	0.02% 1 oz/1,000 ft ³	9828	0.02%	0.019	0.024	0.023
ZR-8570	0.06% 1 oz/1,000 ft ³	9831	0.06%	0.068	0.056	0.061
ZR-8570	0.02% 1 oz/1,000 ft ³	9832	0.02%	0.029	0.027	0.023

Lambda-Cyhalothrin, one of the compounds listed on the label, is not tested in this report.

Test Location: Dallas, TX

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*
 - Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Fifth to sixth instar
 - Describe the insecticide susceptibility status of the test population. Not reported
 - Describe the origin of field collected strains. Not reported
 - If female adults are used - are they gravid? NA
 - Describe rearing techniques.
- Food:** Wayne's Pro-Mix Dry Dog Food
Water via cotton stoppered test tube.

Experiment description:

- List the treatments including the untreated control.

1.	F-240-45-1	0.06%	Hydroprene Fogger	3oz
2.	F-240-45-2	0.02%	Hydroprene Fogger	3oz
3.	F-240-44-1	0.06%	S-Hydroprene Fogger	3oz
4.	F-240-44-2	0.02%	S-Hydroprene Fogger	3oz
5.	F-240-43-1	0.06%	S-Methoprene Fogger	3oz
6.	F-240-43-2	0.02%	S-Methoprene Fogger	3oz
7.	F-240-42-1	0.06%	Fenoxycarb Fogger	3oz
8.	F-240-42-2	0.02%	Fenoxycarb Fogger	3oz
9.	F-240-40-1	0.06%	ZR-8509 Fogger	3oz
10.	F-240-40-2	0.02%	ZR-8509 Fogger	3oz
11.	F-240-39-1	0.06%	ZR-7922 Fogger	3oz
12.	F-240-39-2	0.02%	ZR-7922 Fogger	3oz
13.	F-240-41-1	0.06%	ZR-8570 Fogger	3oz
14.	F-240-41-2	0.02%	ZR-8570 Fogger	3oz
15.	F-240-46-1	-----	Placebo Fogger	3oz

Each product was applied at an a.i. rate of (3 oz = 85 g) 51 mg/3000 cubic feet or 17 mg/3000 cubic feet.

Untreated control replicates consisted of insects exposed to a placebo fogger.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

Place one test fogger in center of fogger chamber and two reps. of each test substrate at 6 ft., 9 ft., and 12 ft. from fogger.
Discharge fogger recording temperature and R.H. at time of treatment.
Allow 20 minutes for mist to settle and remove test substrates to laboratory.
Within one hour of removal place 10 to 12 5th and/or 6th instar German roaches on substrate confined by fluon lined 307x409 open ended round can.
Place 2 pellets of food and one tube of water in can. Cover with organdy square and rubber band.
 - Method(s) of application: Area fogging, but insects exposed to treated surface
 - Number of replicates per treatment: 2
 - Number of individuals per replicate: 10 to 12
 - Length of exposure to treatment (time in seconds, minutes or hours): Continuous for up to 12 weeks
 - Were tested specimens transferred to clean containers? No
 - Experimental conditions (state relative humidity, temperature, and photoperiod): Not reported
 - The type of harborage if used in the experiment: See test apparatus description above

- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

EXAMINATIONS:

Examine all treatments daily for the first 10 days.

Remove and destroy all adult roaches, recording observations.

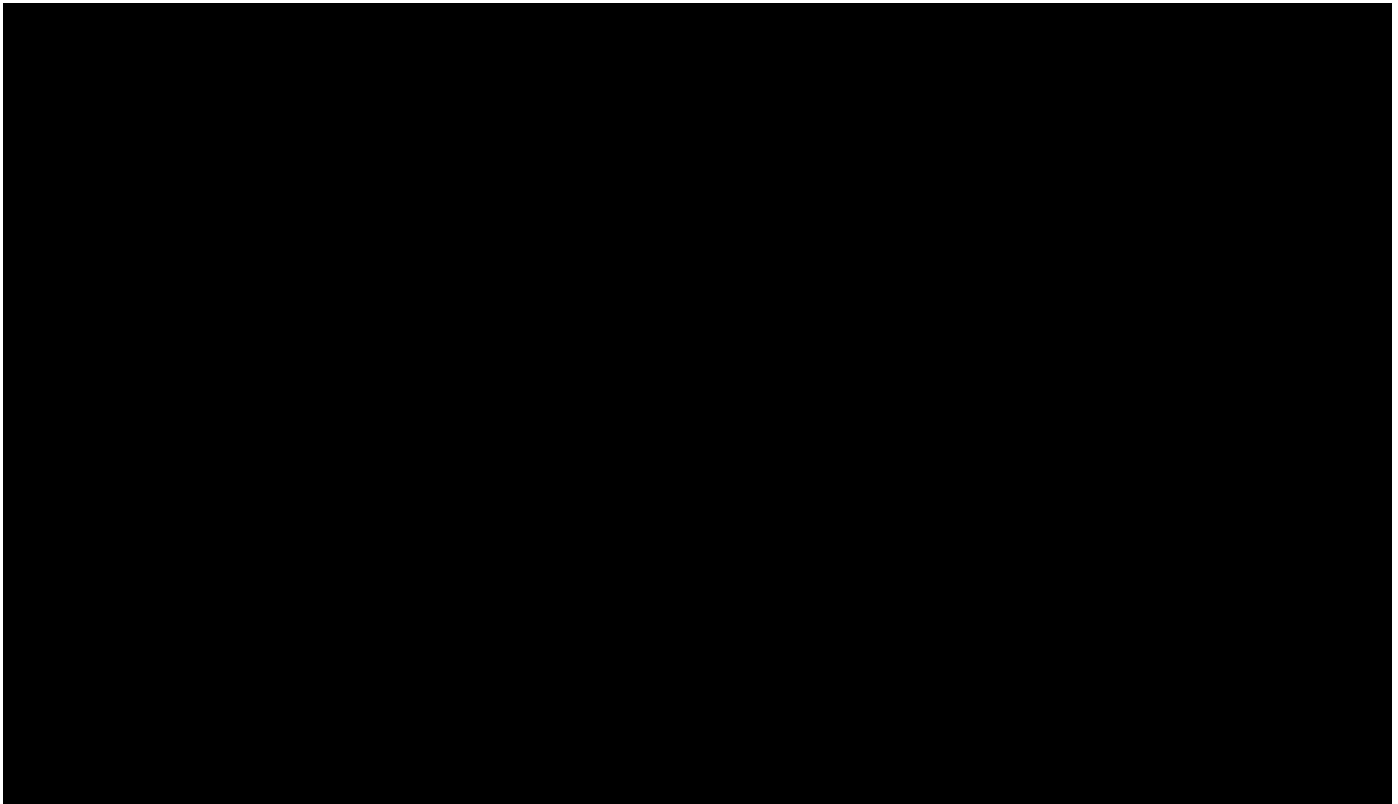
After ten days examine and record status of roaches in each rep. every 7 to 14 days.

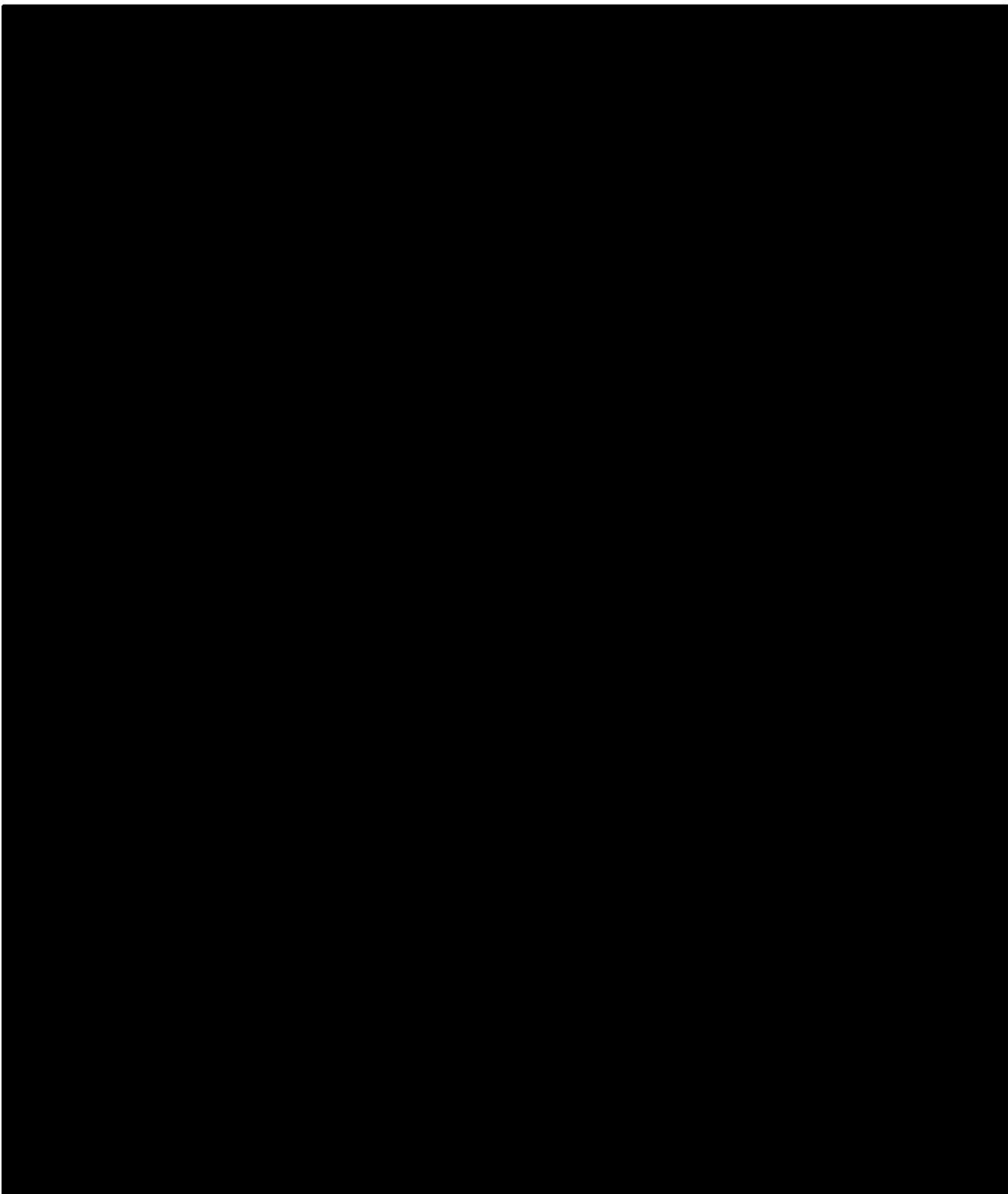
Status Information to be Recorded:

1. Total number of surviving roaches
2. Adult or nymph status of each roach
3. Sex of all adult roaches
4. JH effect on adult roaches if any
5. Dothecia carried
6. Viability of dothecia dropped
7. F₁ progeny produced

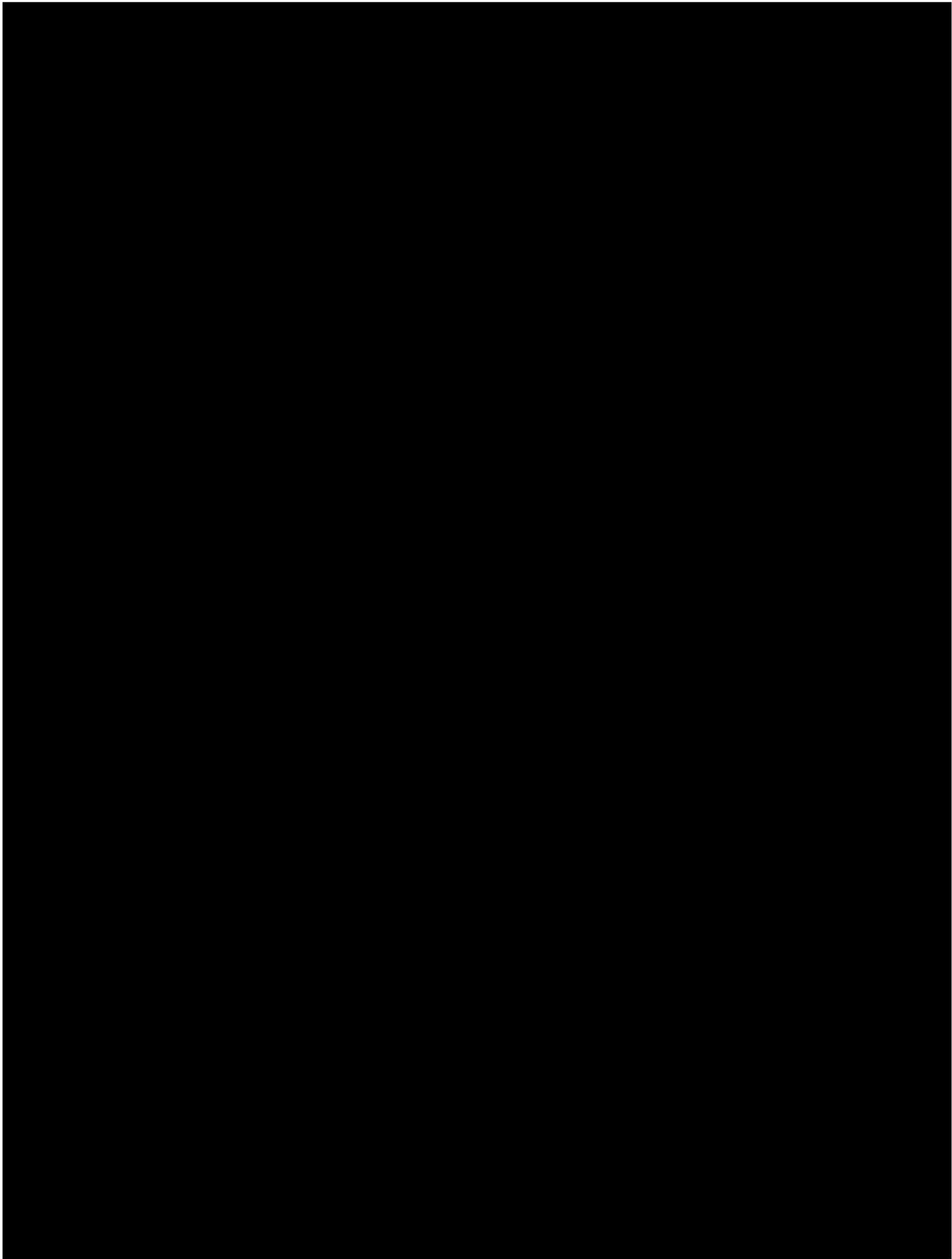
- Report if morbidity and mortality were recorded separately: NA; juvenile hormone effects measured
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results





* Claimed confidential by submitter*



* Claimed confidential by submitter*

Chart VII

F₁ NYMPHS PRODUCED AT INDICATED WEEK

	<u>Week 8</u>	<u>Week 10</u>	<u>Week 12</u>
Placebo	0	348	636
Hydroprene	0	450	703
S-Hydroprene	0	0	95
S-Methoprene	0	877	1,819
Fenoxycarb	0	600	865
ZR-8509	0	153	539
ZR-7922	527	1,841	2,345
ZR-8570	330	1,144	1,106

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Due to the nature of the data recorded (increased observations relative to control), precise calculation of 90% efficacy values was not possible
 - Tested a.i. application rate: 0.02%: approximately 0.01 to 0.03 micrograms/square cm; 0.06%: 0.03 to 0.08 micrograms/square cm (Table II). The 0.06% rate consistently deposited about three times the 0.02% rate
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Vinyl tile, glass, unpainted wood
 - Formulation type (e.g. aerosol, granular): Aerosol fogger
 - Application type (e.g. direct, surface, area): Area fogging with surface deposition
 - Timepoints at which corresponding control mortality is greater than 10%: NA; mortality not recorded

Conclusions

S-hydroprene gave the strongest control of reproduction of any of the seven compounds tested. Only at the lowest level on the most adverse surface glass (adverse for this compound) did reproduction occur. With S-hydroprene rates between 5 and 9~~4~~g/ft² completely prevented reproduction where with racemic hydroprene some reproduction occurred even at the highest rate of 34~~4~~g/ft². This reflects greater than a six-fold increase in activity for S-hydroprene vs.

R-S-hydroprene. The overall JH effect was second to fenoxycarb.

- The replications described are not true replications as they represent one application of the product with two sampling units.
- Lambda-Cyhalothrin, one of the active ingredients on the label, was not included in this test.
- Because of how the data were collected (increased observations relative to control), precise calculation of 90% efficacy levels were not possible.
- The product tested is a different formulation than that labeled (aerosol fogger versus aerosol surface spray).
- Control data were inadequate because of possible contamination.

Study 2

Efficacy Study Data Evaluation Record

Title:

84-7A - Permethrin/(S)-Hydroprene RTU Field Tests

Purpose/Objective:

To field test in apartments (S)-Hydroprene + Permethrin against German cockroaches.

Materials and Methods

Test Material(s): 0.11% Permethrin + 0.15% (S)-Hydroprene RTU

26 oz (737.1 g) of the formulation was applied to individual apartments, with each apartment treated at an a.i. rate of 810.8 mg/unit Permethrin + 1105.7 mg/unit (S)-Hydroprene.

The tested formulation did not contain Lambda-Cyhalothrin, and contained Permethrin, unlike the labeled product.

Test Location: Richardson, Texas

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Mixed age and sex naturally occurring population
- Describe the insecticide susceptibility status of the test population. Not determined
- Describe the origin of field collected strains. Natural population in Richardson, Texas
- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. NA; natural field populations used

Experiment description:

- List the treatments including the untreated control.

0.11% Permethrin + 0.15% (S)-Hydroprene RTU

26 oz (737.1 g) of the formulation was applied to individual apartments, with each apartment treated at an a.i. rate of 810.8 mg/unit Permethrin + 1105.7 mg/unit (S)-Hydroprene.

The tested formulation did not contain Lambda-Cyhalothrin, and contained Permethrin, unlike the labeled product.

Control replicates were not performed; data are calculated based on pre-treatment observations.

- Include a description of:

- Test arenas and/or apparatus (include site description and location):

This formulation F-206-106-6, L 243-116-1, was used to treat 21 units (building 2, 3, & 4) of the Spring Valley Apartments (see attachment 1, site plan). Each unit was a two story apartment with kitchen and half bath downstairs and one full bath upstairs. Each apartment was treated with 26oz. of formulation (split between kitchen and bathrooms). The treatment was applied with a B&G compressed air sprayer.

Data were taken via sticky cockroach traps. Three traps were placed in the kitchen and picked up 24 hours later. All German cockroaches were counted and recorded to achieve a total number of roaches per apartment. This was done before treatment and once a month post treatment. The efficacy parameters (% control, % JH adults, and % nymphs) were calculated based on the total of all traps from all 21 apartments.

- Method(s) of application: Surface
 - Number of replicates per treatment: 21 applications
 - Number of individuals per replicate: 3 traps per unit
 - Length of exposure to treatment (time in seconds, minutes or hours): Continuous for 8 months
 - Were tested specimens transferred to clean containers? No
 - Experimental conditions (state relative humidity, temperature, and photoperiod): Ambient household conditions
 - The type of harborage if used in the experiment: Harborage as occurring in the treated structure
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): % control, % JH adults, % nymphs
 - Report if morbidity and mortality were recorded separately: NA; living specimens on sticky traps were recorded
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

ATTACHMENT II

84-7A Permethrin/Hydroprene Ready To Use for Cockroach Control

Spring Valley Town Homes treated with 0.11% permethrin & 0.15% (S)-Hydroprene RTU; Rate 26oz per apartment; initiated 8-6-85; F-206-106-6; L-243-116-1

Pre-Treatment Total	Test Parameters	Total Number German Cockroaches at Indicated Months Post Treatment								
		1	2	3	4**	5	6	7***	8	9
1739	*JH Adult	175	165	241	227	73	81	78	214	
	Total Adult	280	222	300	291	96	100	102	237	
	Total Nymph	780	471	266	271	88	82	58	56	
	Total Roaches	1060	693	566	562	184	182	160	293	
	% Reduction	39	60	67	68	89	90	89	83	
	% JH Adults	63	74	80	78	76	81	76	90	
	% Nymphs	74	68	47	48	48	45	36	19	

* JH = Juvenile Hormone (S-Hydroprene) Affected

** Retreated at 4 months (12-17-85)

*** Traps could not be recovered from Apt. 149, thus the pre-treatment counts for this apartment were excluded from the overall control calculations. Pre-treatment total for 7 months data was 1454.

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Total cockroaches compared to pretreatment total: 7 months after initial treatment (3 months after retreatment), % reduction = 6 months after initial treatment (2 months after retreatment). Other endpoints could not be compared to pretreatment counts
 - Tested a.i. application rate: 810.8 mg/unit Permethrin + 1105.7 mg/unit (S)-Hydroprene
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Surfaces in household unit
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Surface
 - Timepoints at which corresponding control mortality is greater than 10%: NA; data based on comparison to pre-treatment data (for total roaches) or pre-treatment observations were not recorded.

Conclusions

- Application of 810.8 mg/unit Permethrin + 1105.7 mg/unit (S)-Hydroprene caused $\geq 90\%$ reduction in the total number of cockroaches recovered relative to pretreatment counts at 6 months after initial treatment (2 months after retreatment).

- Pre-treatment observations were not presented, therefore 90% efficacy levels could not be confirmed.
- The tested formulation did not contain Lambda-Cyhalothrin, and contained Permethrin, unlike the labeled product.
- Untreated control replicates were not conducted.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

**MRID 402633-01. Zoecon RF-270 Emulsifiable Concentrate EPA File Symbol 2724-GLL
Response to Agency Letter Dated 9 March 1987. Parker, K.J. Year.**

OCSPP Product Performance Guideline: 810.3600

**Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044**

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AS}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AE}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{RE}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600
MRID:	402633-01. Zoecon RF-270 Emulsifiable Concentrate EPA File Symbol 2724-GLL Response to Agency Letter Dated 9 March 1987. Parker, K.J. Year.
	This study reports no product efficacy data on insects.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Not provided
TESTING FACILITY:	Zoecon Industries, 12200 Denton Drive, Dallas, TX 75234
STUDY DIRECTOR or INVESTIGATOR:	Not provided
SUBMITTER:	Kelly J. Parker, Regulatory Specialist
STUDY COMPLETED:	28/05/1987
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	Not reported
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Zoecon RF-270 Emulsifiable Concentrate EPA File Symbol 2724-GLL Response to Agency Letter Dated 9 March 1987. [This report presents the results of spray data, and no bioassays on insects are presented]

Purpose/Objective: Not reported

Materials and Methods

Test Material(s): None

Test Location: Dallas, Texas

Positive Control/Reference Standard, if used: NA

Species Tested:

- Common name and scientific name of each species. NA
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. NA
- Describe the insecticide susceptibility status of the test population. NA
- Describe the origin of field collected strains. NA
- If female adults are used - are they gravid? NA
- Describe rearing techniques. NA

Experiment description:

- List the treatments including the untreated control. NA
- Include a description of:
 - Test arenas and/or apparatus (include site description and location): NA
 - Method(s) of application: NA
 - Number of replicates per treatment: NA
 - Number of individuals per replicate: NA
 - Length of exposure to treatment (time in seconds, minutes or hours): NA
 - Were tested specimens transferred to clean containers? NA
 - Experimental conditions (state relative humidity, temperature, and photoperiod): NA
 - The type of harborage if used in the experiment: NA
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): NA
 - Report if morbidity and mortality were recorded separately: NA
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): NA

Data Reported/Results

- No bioassay data are presented.
- Deviations or amendments from the protocol. NA
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. NA
 - Tested a.i. application rate: NA
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): NA
 - Formulation type (e.g. aerosol, granular): NA
 - Application type (e.g. direct, surface, area): NA
 - Timepoints at which corresponding control mortality is greater than 10%: NA

Conclusions

- This report did not present any insect bioassay data.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

**MRID 445355-09. Cockroach Efficacy Summary for Hydroprene Insect Growth Regulator.
VanGundy, D. 1998.**

OCSP Product Performance Guideline: 810.3600

**Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044**

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{PS}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{PS}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{PS}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600
MRID:	445355-09. Cockroach Efficacy Summary for Hydroprene Insect Growth Regulator. VanGundy, D. 1998.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Robin Rudolph
TESTING FACILITY:	Wellmark International, 12200 Denton Drive, Dallas, TX 75234
STUDY DIRECTOR or INVESTIGATOR:	Doug VanGundy, Study Director
SUBMITTER:	Steven R. Spaulding, Manager Regulatory Affairs
STUDY COMPLETED:	N/A
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	<p>The summarized studies were not conducted according to the principles of Good Laboratory Practices and are not in compliance with the United States Environmental Protection Agency's Federal Insecticide, Fungicide, and Rodenticide Act, Good Laboratory Practice Regulations, 40 CFR Part 160, current edition.</p> <p>The studies were not in compliance with 40 CFR Part 160, for the following reasons. Non-compliance with sections: 160.35, 160.47, 160.63, 160.81, 160.105, 160.107, 160.120, 160.195 part (d).</p>
TEST MATERIAL:	<p>PRODUCT NAME: RF2228 LH Aerosol</p> <p>EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU</p> <p>ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene</p> <p>CHEMICAL NAME: Not provided</p> <p>A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36%</p> <p>PC CODE: PRIA</p>

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Cockroach Efficacy Summary for Hydroprene Insect Growth Regulator.

Purpose/Objective:

To summarize several efficacy reports to support the argument that regardless of formulation the Insect Growth Regulator hydroprene will provide equivalent efficacy independent of formulation.

Materials and Methods

Test Material(s):

CAS # (s)-hydroprene - 65733-16-6
CAS # r,s-hydroprene - 40596-69-8

Summary reports intended to support efficacy of the active ingredients at 1.4 mg/square foot application rate.

This report presents summarized study results by using a variety of methods. The presentation precludes the completion of the standard templates.

Test Location: Various

Positive Control/Reference Standard, if used: See individual results summaries

Species Tested:

- Common name and scientific name of each species. See individual results summaries
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. See individual results summaries
- Describe the insecticide susceptibility status of the test population. See individual results summaries
- Describe the origin of field collected strains. See individual results summaries
- If female adults are used - are they gravid? See individual results summaries
- Describe rearing techniques. See individual results summaries

Experiment description:

- List the treatments including the untreated control.

CAS # (s)-hydroprene - 65733-16-6
CAS # r,s-hydroprene - 40596-69-8

Summary reports intended to support efficacy of the active ingredients at 1.4 mg/square foot application rate.

This report presents summarized study results by using a variety of methods. The presentation precludes the completion of the standard templates.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location): See individual results summaries
 - Method(s) of application: See individual results summaries
 - Number of replicates per treatment: See individual results summaries
 - Number of individuals per replicate: See individual results summaries
 - Length of exposure to treatment (time in seconds, minutes or hours): See individual results summaries
 - Were tested specimens transferred to clean containers? See individual results summaries
 - Experimental conditions (state relative humidity, temperature, and photoperiod): See individual results summaries
 - The type of harborage if used in the experiment: See individual results summaries
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): See individual results summaries
 - Report if morbidity and mortality were recorded separately: See individual results summaries
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): See individual results summaries

Data Reported/Results

Report TR-921

The critical affected stage of German Cockroaches to the Insect Growth Regulator
Hydroprene (ZR-512)

Preliminary laboratory study investigating which nymphal stage is most critically affected by hydroprene. Applications to surfaces were made at rate of 0.24 mg/ft² and 1.4 mg/ft². Different age German cockroach nymphs were placed on treated surfaces and periodically evaluated for hydroprene affected adults. Results indicated the younger instars were not as susceptible as were the older nymphs. The 0.24 mg/ft² rate was too low to be considered efficacious. The 1.4 mg/ft² rate provided the greatest success in causing hydroprene-affected adults. In replicates with 3rd and 5th instar roaches 100% and 93% respectively, became affected by hydroprene as they molted to adults.

Report TR-1126
Cockroach Efficacy field Tests in Richardson Heights Apartments with RF-254, L233-98-1
(0.25% permethrin +0.6% hydroprene aerosol)

Field study conducted in apartments using 1 six-ounce aerosol per apartment. Hydroprene application rate was ca. one gram per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Twenty apartments were treated in this study. Application of the aerosol was made to the cabinets, under sinks, refrigerators and ranges. Re-treatment occurred at five months using the same methodology. Evaluations of efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted for each apartment. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at eight months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Data table below summarizes results.

Data Summary Table

Test Parameters	Months Post-treatment					
	1	2	3	4.5	6.5	8
% Reduction	76	68	85	86	96	97
% Affected Adults	52	96	90	87	76	96
% Nymphs of Total Trapped Roaches	72	62	44	29	16	30

Report TR-1127
Cockroach Efficacy Field Tests in Briarwood Apartments with F-215-143-1
(0.25% permethrin + 0.6% hydroprene fogger)

Field study conducted in apartments using 2- five-ounce foggers per apartment. Hydroprene application rate was two grams per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Sixteen apartments were treated in this study. Application of the foggers were made by placing a fogger in the kitchen and one in the bathroom doorway. Re-treatment occurred at four and ten months post-treatment using the same methodology. Evaluations of efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted for each apartment. Data points were made at monthly intervals for five months then at months 8, 9, and 11. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at eleven months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Data table below summarizes results.

Data Summary Table

Test Parameters	Months Post-treatment							
	1	2	3	4	5	8	9	11
% Reduction	64	54	44	68	95	93	92	99
% Affected Adults	79	86	66	60	78	85	68	38
% Nymphs of Total Trapped	63	59	46	51	58	27	53	27

Report TR-1148
Propetamphos/Hydroprene E.C. Apartment trials, Mesquite Texas 1985-1986

Field study conducted in apartments using a dilutable spray dispensed from a compressed air spray. The test material was a combination of the adulticide propetamphos and the IGR r,s-hydroprene. The end use dilution of the materials was 1% propetamphos /0.12% r,s-hydroprene. Hydroprene application rate was one gram per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Twenty-one apartments were treated in this study. Application of the dilution was made by compressed air sprayer to the empty cabinets, under sinks and refrigerators, and baseboards of the kitchen and bath areas. One quart of dilution was used per apartment. Re-treatment occurred at six months post-treatment using the same methodology. Evaluations of efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the lab and the number of cockroaches counted for each apartment. Data points were made at monthly intervals. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at ten months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Data table below summarizes results.

Data Summary Table

Test Parameters	Months Post-treatment						
	2	3	4	7	8	9	10
% Reduction	45	57	80	89	91	92	95
% Affected Adults	68	66	80	38	56	56	61
% Nymphs of Total Trapped	49	31	33	44	47	49	27

Report TR-1188

Cockroach Efficacy Field Tests in Winchester Ranch Apartments, with YRF-300, Lot 255-79-1,
(0.3% s-hydroprene + 0.25% permethrin) Water-base fogger

Field study conducted in apartments using 2- six-ounce foggers per apartment. Hydroprene application rate was one gram per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Twenty -1000 ft² apartments were treated in this study. Application of the foggers were made by placing a fogger in the kitchen and one in the bathroom doorway. Re-treatment did not occur. Evaluations of efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted from each apartment. Data points were made at monthly intervals for four months. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at four months post-treatment. This study was concluded early due to formulation problems with the product.

Although the study was not continued after four months the efficacy is considered acceptable during the four-month interval. Data table below summarizes results.

Data Summary Table

Test Parameters	Months Post-treatment			
	1	2	3	4
% Reduction	65	82	79	88
% Affected Adults	64	80	89	92
% Nymphs of total trapped	53	64	41	34

Report TR-1172
Field Trials with Permethrin/(S)-Hydroprene RTU for Cockroach control

Field study conducted in apartments using a Ready-to-Use spray dispensed from a compressed air spray. The test material was a combination of the adulticide permethrin and the IGR s-hydroprene. The end use dilution of the materials was 0.11% permethrin /0.15% s-hydroprene. Hydroprene application rate was 0.9 gram per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Twenty-one apartments were treated in this study. Application of the dilution was made by compressed air sprayer to the empty cabinets, under sinks and refrigerators, and baseboards of the kitchen and bath areas. Twenty-six ounces of spray was used per apartment. Re-treatment occurred at four months post-treatment using the same methodology. Evaluations for efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the lab and the number of cockroaches counted for each apartment. Data points were made at monthly intervals. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at eight months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Data table below summarizes results.

Data Summary Table								
Test Parameters	Months Post-Treatment							
	1	2	3	4	5	6	7	8
% Reduction	35	55	64	68	89	90	89	83
% Affected Adults	63	73	80	78	76	81	76	90
% Nymphs of Total Trapped	74	68	47	48	48	45	36	19

Report TR-1190
Winchester Ranch Apartment Trials with 0.25% permethrin/0.3%(S)-Hydroprene water-based

Field study conducted in apartments using 1 twelve-ounce aerosol per apartment. Hydroprene application rate was one gram per apartment. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Twenty-six apartments were treated in this study. Application of the aerosol was made to the cabinets, under sinks, refrigerators and ranges. Re-treatment occurred at five months using same methodology. Evaluations for efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted for each apartment. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at eight months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Although reduction in the population was slower initially than previous studies by the end of the study reduction in cockroach populations reached 99%. Data table below summarizes results.

Data Summary Table						
Test Parameters	Months Post-treatment					
	1	2	3	4	5	6
% Reduction	25	35	52	75	94	99
% Affected Adults	68	81	91	88	93	100
% Nymphs of Total Trapped	67	61	44	53	23	33

Winchester Ranch Apartment Trials with RF-200 containing (s)-Hydroprene in a twelve ounce water-based aerosol

Field study conducted in apartments using 1 twelve-ounce aerosol per apartment. Hydroprene application rate was one gram per apartment. The product contained 0.2% pyrethrins, 1% PBO, 1% MGK-264 and 0.3% (s)-hydroprene. Application was made to sites of infestation in the kitchen and bath areas of the apartments. Eight apartments were treated in this study. Application of the aerosol was made to the cabinets, under sinks, refrigerators and ranges. Re-treatment occurred at four months using the same methodology. Evaluations for efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted for each apartment. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was concluded at eight months post-treatment.

The treatment successfully controlled cockroaches by the end of the study. Data table below summarizes results.

Data Summary Table

Test Parameters	Months Post-treatment				
	1	2	3	4	5
% Reduction	86	90	86	97	99
% Affected Adults	54	29	75	50	0
% Nymphs of Total Trapped Roaches	70	57	67	47	100

Report TR-1571

Efficacy of (S)-hydroprene when placed into a point source release device against the German Cockroach *Blattella germanica* in multi-family dwellings

Field study incorporating a different delivery method than previous reports. The delivery device takes advantage of the mobility or translocation ability of hydroprene. Each device contained 120 milligrams of technical (s)-hydroprene in a clam shell holder with an absorbent paper from where the hydroprene relocates into the local environment. Each device treats up to a 75 ft² area, which was equivalent to 1.2 -1.6 mg/ft² depending on the treatment regimen. The study was established as a rate study to determine the efficacy of hydroprene based on the number of devices placed per apartment. The primary objective of the study was to determine the impact the point source devices had on the population of roaches with regard to causing affected adults. The study also included evaluations of the device in conjunction with a conventional toxicant contained in a bait station. The rates of application were 12-120 mg each, 9-120 mg each, & 6-190 mg each, devices per individual apartment. In the bait station/point source evaluation, 9 - 120 mg point source devices and 12 toxicant bait stations were placed per apartment. A treatment of 12 toxicant bait stations was also included. Evaluations for efficacy were made by using sticky traps placed in each apartment for 24 hours and then removed and brought back to the laboratory and the number of cockroaches counted for each apartment. Pre-treatment counts were made to establish baseline populations for determining percent reduction and percent affected adults within the population. The study was conducted over a 13-month period. Evaluations of efficacy using hydroprene only require longer evaluation periods than when hydroprene is used in conjunction with a toxicant. Re-treatments were made every three months during the study. The point source only treatments were made to sixteen units each. The toxicant bait/ point source treatments were placed in eight unit buildings.

The nine and twelve device treatments provided satisfactory control of cockroaches over the study duration. The six-device treatment was dropped due to poor efficacy. The bait station/point source device treatments provided good control of cockroaches. Summary data will only be included for the 12 and 9 point source device treatments.

Data Summary Table
12 point source devices

Test Parameters	Months Post-Treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
% Reduction	+3	49	75	76	81	72	71	68	77	66	77	70
% Affected Adults	48	73	81	75	83	82	85	80	83	82	90	84
% Nymphs of Total	83	75	68	62	64	61	58	59	52	52	49	49

Report TR-1571

Data Summary Table
9 point source devices

Test Parameters	Months Post-Treatment											
	1	2	3	4	5	6	7	8	9	10	11	12
% Reduction	0	+1	70	77	86	81	79	75	80	76	80	80
% Affected Adults	30	73	72	73	79	80	88	80	86	74	88	81
% Nymphs of Total	85	83	69	60	57	48	51	50	46	54	50	51

To Investigate the Effects of Various rates of (s)-hydroprene on *Blattella germanica*

Laboratory evaluation to determine the residual activity and efficacy of (s)-hydroprene at rates of 15 mg/m² (1.4 mg/ft²), 7.5 mg/m² (0.68mg/ft²), 3.7 mg/m² (0.33mg/ft²). The objective was to determine the optimal monthly application rate that would be equivalent to a single label application rate in which residual activity lasts for three to four months. The formulation used was the Gentrol EC, which contains 9% (s)-hydroprene. Bioassay was conducted by treating masonite panels with the various application rates and exposing 3rd instar German cockroach nymphs over a four month time period. The lower application rates were re-applied every month as well as additional 3rd instar roaches introduced in all treatments at the same interval. All treatments successfully caused a high degree of wing twisting within those nymphs molting to adults.

Data Summary Table

Percent hydroprene affected adults								
Treatment	2weeks	4weeks	6weeks	8weeks	10weeks	12weeks	14weeks	16weeks
1.4 mg/ft ²	0	100	100	100	95.1	82.5	82.9	82.6
0.68 mg/ft ²	0	100	100	100	100	98.9	98.9	98.9
0.33 mg/ft ²	0	100	100	100	98.7	95.9	97.3	98.6
Control	0	0	0	2.3	1.1	1.8	2.4	3.9

Table 1

Efficacy comparison of aerosol formulations in apartment studies

Percent reduction of cockroaches

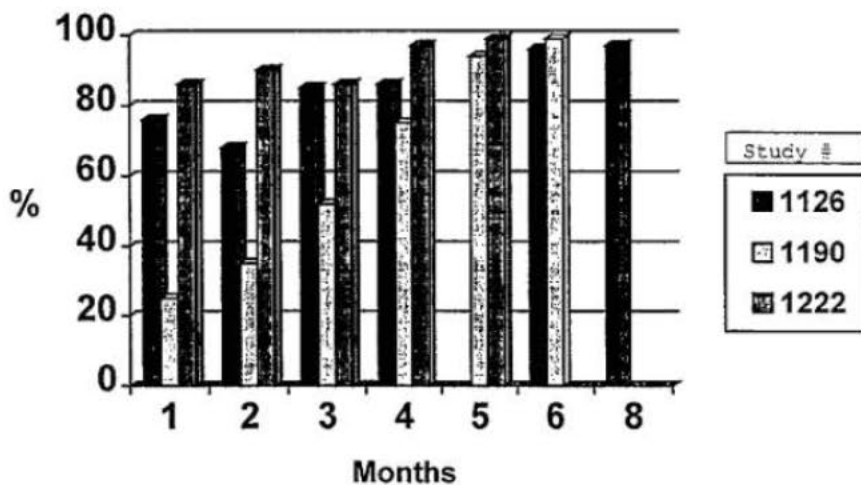
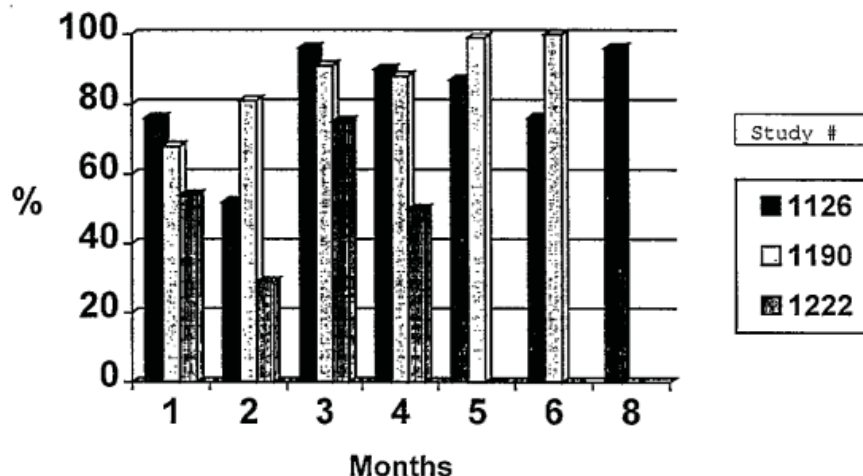


Table 2
Efficacy comparison of aerosol formulations in apartment studies

Percent Affected Adult cockroaches



- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. See individual summary reports
 - Tested a.i. application rate: Target rate: 1.4 mg/square foot
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): See individual summary reports
 - Formulation type (e.g. aerosol, granular): See individual summary reports
 - Application type (e.g. direct, surface, area): See individual summary reports
 - Timepoints at which corresponding control mortality is greater than 10%: See individual summary reports

Conclusions

- This report presented summaries of several reports in a format that did not allow the completion of the templates.
- Summary reports intended to support efficacy of the active ingredients at 1.4 mg/square foot application rate.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 453316-09. Residual Efficacy of Chemsico Home Insect Control 3L EPA Reg. No. 9688- against: German Roaches, Carpenter Ants, Crickets. Schoenberg, P.L. 2001.

OCSPP Product Performance Guideline: 810.3600; Guideline 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AB}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AB}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AB}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600; Guideline 158.640
MRID:	453316-09. Residual Efficacy of Chemsico Home Insect Control 3L EPA Reg. No. 9688- against: German Roaches, Carpenter Ants, Crickets. Schoenberg, P.L. 2001.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Charles A. Duckworth, Vice President, R&D
TESTING FACILITY:	United Industries Corp., 8825 Page Blvd., St. Louis, MO 63114
STUDY DIRECTOR or INVESTIGATOR:	Paul L. Schoenberg, Research Specialist
SUBMITTER:	Kathy J. Tryson, Director, Product Registration
STUDY COMPLETED:	27/11/2000
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	<p>The study detailed in this report was not conducted fully under the Good Laboratory Practice Regulations, 40 CFR Part 160, pursuant to Section 160.3, Study.</p> <p>The Good Laboratory Practice Regulations do not require a Product Performance Study to be conducted under GLP Guidelines unless it is specifically required under Section 158.640 (Only Antimicrobial and Vertebrate Control Agents are listed). This study does not fall into that category.</p> <p>The following items within the Good Laboratory Practice Guidelines were not followed:</p> <p>--No Quality Assurance Audit was conducted during the conduct of the study.</p> <p>--Protocols were not approved in writing prior to the initiation of the study.</p>
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU

ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin,
(S)-Hydroprene

CHEMICAL NAME: Not provided

A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene
0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Residual Efficacy of Chemsico Home Insect Control 3L EPA Reg. No. 9688- against: German Roaches, Carpenter Ants, Crickets.

Purpose/Objective:

To measure knockdown and/or kill of crawling insects when exposed to a dry deposit of insecticidal product.

Materials and Methods

Test Material(s): Chemsico Home Insect Control 3L, 0.03% Lambda-Cyhalothrin

A mean of 0.8 g of the product was applied to six-inch square (36 square inches) vinyl tile to the point of wetness at an a.i. rate of 0.24 mg/36 square inches Lambda-Cyhalothrin.

(S)-Hydroprene, the other active ingredient in the labeled formulation, was not tested in this study.

Test Location: St. Louis, Missouri

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*; carpenter ant, *Camponotus* (species not identified); cricket (species not identified, but presumably *Acheta domesticus*)
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. German cockroach: male; carpenter ant: mixed sex, no queens; cricket: not reported
- Describe the insecticide susceptibility status of the test population.
- Describe the origin of field collected strains.
 - a. German roaches, male, from United Industries Insectary
 - b. Carpenter Ants, mixed sex, no queens, from Connecticut Valley Biological.
 - c. Crickets, from Connecticut Valley and local bait shop.
- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Chemsico Home Insect Control 3L, 0.03% Lambda-Cyhalothrin

A mean of 0.8 g of the product was applied to six-inch square (36 square inches) vinyl tile to the point of wetness at an a.i. rate of 0.24 mg/36 square inches Lambda-Cyhalothrin.

(S)-Hydroprene, the other active ingredient in the labeled formulation, was not tested in this study.

Untreated control replicates consisted of untreated control samples.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
A total of 3 6-inch square no-wax vinyl flooring samples were sprayed with Chemsico Home Insect Control 3L at the beginning of the study (actual application date was 5/12/00). Application of the ready to use (RTU) test material was trigger sprayed onto the tile until the surface was wet. The actual amount of wet deposit of product onto each tile was then recorded. Weights are detailed in Table 1. The treated tiles were allowed to dry before initial testing.
 - Method(s) of application: Surface
 - Number of replicates per treatment: 3
 - Number of individuals per replicate: German cockroach and carpenter ant: 8 to 10; cricket: 5
 - Length of exposure to treatment (time in seconds, minutes or hours): 4 hr
 - Were tested specimens transferred to clean containers? Yes
 - Experimental conditions (state relative humidity, temperature, and photoperiod): Not recorded
 - The type of harborage if used in the experiment: See test apparatus description above
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): Knockdown (criteria not defined) at 1, 2, 3 and 4 hr; and mortality (criteria not defined) at 24 hr.
 - Report if morbidity and mortality were recorded separately:
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

Mortality of German Roaches (Male) after Exposure
To Treated No-Wax Vinyl Flooring (8-10 Insects per Application)

<u>Sample</u>	<u>1 Month</u>	<u>3 Month</u>	<u>4 Month</u>	<u>5 Month</u>	<u>6 Month</u>
.03A	100%	100%	100%	100%	100%
.03B	100%	100%	100%	100%	100%
.03C	100%	100%	100%	100%	100%
Average	100%	100%	100%	100%	100%
Untreated Control	--- *	0%	0%	0%	0%

* Not Conducted

Mortality of Carpenter Ants after Exposure
To Treated No-Wax Vinyl Flooring (8-10 Insects per Application)

<u>Sample</u>	<u>4 Month</u>	<u>5 Month</u>	<u>6 Month</u>
.03A	100%	100%	100%
.03B	100%	100%	100%
.03C	100%	100%	90%
Average	100%	100%	97%
Untreated Control	0	13%	0%

Mortality of Crickets after Exposure
To Treated No-Wax Vinyl Flooring (5 Insects per Application)

<u>Sample</u>	<u>4 Month</u>	<u>5 Month</u>	<u>6 Month</u>
.03A	100%	100%	100%
.03B	100%	100%	100%
.03C	100%	100%	100%
Average	100%	100%	100%
Untreated Control	0%	40%	7%

Table V

Speed of Knockdown Data Against German Roaches (Male) (In Hours) (%)

<u>Sample</u>	<u>1 Month</u>				<u>3 Month</u>				<u>4 Month</u>				<u>5 Month</u>				<u>6 Month</u>			
	1H	2H	3H	4H	1H	2H	3H	4H	1H	2H	3H	4H	1H	2H	3H	4H	1H	2H	3H	4H
.03A	88	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
.03B	50	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
.03C	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Average	79	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Speed of Knockdown Against Carpenter Ants (In Hours) (%)

<u>Sample</u>	<u>4 Month</u>				<u>5 Month</u>				<u>6 Month</u>			
	1H	2H	3H	4H	1H	2H	3H	4H	1H	2H	3H	4H
.03A	100	100	100	100	100	100	100	100	100	100	100	100
.03B	100	100	100	100	100	100	100	100	90	100	100	100
.03C	100	100	100	100	100	100	100	100	100	100	100	100
Average	100	100	100	100	100	100	100	100	97	100	100	100

Speed of Knockdown Against Crickets (In Hours) (%)

<u>Sample</u>	<u>4 Month</u>				<u>5 Month</u>				<u>6 Month</u>			
	1H	2H	3H	4H	1H	2H	3H	4H	1H	2H	3H	4H
.03A	100	100	100	100	100	100	100	100	100	100	100	100
.03B	100	100	100	100	100	100	100	100	100	100	100	100
.03C	100	100	100	100	100	100	100	100	100	100	100	100
Average	100	100	100	100	100	100	100	100	100	100	100	100

- Deviations or amendments from the protocol. None reported
 - For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed.
- Mortality: 24 hr for German cockroach on tiles aged 1, 3, 4, 5, and 6 months after treatment, carpenter ant and cricket at 4, 5, and 6 months after treatment;

Knockdown: German cockroach within 2 hr on tiles aged 1 month and within 1 hr on tiles aged 3, 4, 5, and 6 months, carpenter ant and cricket: within 1 hr on tiles ages 4, 5, and 6 months.

- Tested a.i. application rate: 0.24 mg/36 square inches Lambda-Cyhalothrin
- Surface tested, for residual studies (e.g. ceramic tile, wood panel): Vinyl tile
- Formulation type (e.g. aerosol, granular): Liquid
- Application type (e.g. direct, surface, area): Surface
- Timepoints at which corresponding control mortality is greater than 10%:
Mortality: carpenter ant 5 months after treatment (13%) and cricket 5 months after treatment (40%)

Conclusions

- Application of Chemsico Home Insect Control 3L at an a.i. rate of 0.24 mg/36 square inches to vinyl tile caused $\geq 90\%$ mortality within 24 hr to German cockroaches on tiles aged 1, 3, 4, 5, and 6 months after treatment, carpenter ant and cricket at 4, 5, and 6 months after treatment.
- Application of Chemsico Home Insect Control 3L at an a.i. rate of 0.24 mg/36 square inches to vinyl tile caused $\geq 90\%$ knockdown to German cockroach within 2 hr on tiles aged 1 month and within 1 hr on tiles aged 3, 4, 5, and 6 months, and to carpenter ant and cricket within 1 hr on tiles ages 4, 5, and 6 months.
- (S)-Hydroprene was not tested in this report.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 453384-01. Evaluation of a Whitmire Micro-Gen Aerosol Formulation (0.0500% Lambda-Cyhalothrin) for the Treatment of Red Imported Fire Ant Mounds on Urban Properties in Texas. Lovelady, C.L. 2001.

OCSPP Product Performance Guideline: 810.3600; Guideline 158.640

**Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044**

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AE}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AE}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AE}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

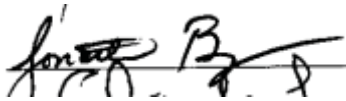
Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, 40 CFR 158.640
MRID:	453384-01. Evaluation of a Whitmire Micro-Gen Aerosol Formulation (0.0500% Lambda-Cyhalothrin) for the Treatment of Red Imported Fire Ant Mounds on Urban Properties in Texas. Lovelady, C.L. 2001.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	[Illegible] 
TESTING FACILITY:	International Institute for Urban & Social Insects, A Division of Granovsky Associates, Inc.
STUDY DIRECTOR or INVESTIGATOR:	Clark N. Lovelady, Study Director
SUBMITTER:	Dana M. Thomas, Manager, Product Registrations
STUDY COMPLETED:	09/2000
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was <u>NOT</u> conducted in compliance with Good Laboratory Practice Standards as described by EPA (40 CFR Parts 160 and 792), and was never intended for that purpose.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Evaluation of a Whitmire Micro-Gen Aerosol Formulation (0.0500% Lambda-Cyhalothrin) for the Treatment of Red Imported Fire Ant Mounds on Urban Properties in Texas.

Purpose/Objective:

Determine the efficacy of the Whitmire Micro-Gen aerosol formulation (TC-205 0.0500% Lambda-Cyhalothrin) for the control of the red imported fire ant (*Solenopsis invicta* Buren) mounds on urban properties in Texas.

Materials and Methods

Test Material(s): 0.05% Lambda-Cyhalothrin, injected 4 to 8 times per mound for 10 seconds per injection, with a top dressing for three seconds on the mound top. The amount of the formulation dispensed was not recorded.

(S)-Hydroprene, one of the active ingredients in the labeled formulation, was not tested in this report.

Test Location: Bryan, Texas

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. Red imported fire ant, *Solenopsis invicta*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Mixed age
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains. Field populations in Bryan, Texas
- If female adults are used - are they gravid? NA; worker activity recorded
- Describe rearing techniques. NA; natural field populations used

Experiment description:

- List the treatments including the untreated control.

0.05% Lambda-Cyhalothrin, injected 4 to 8 times per mound for 10 seconds per injection, with a top dressing for three seconds on the mound top. The amount of the formulation dispensed was not recorded.

(S)-Hydroprene, one of the active ingredients in the labeled formulation, was not tested in this report.

Untreated control replicates consisted of mounds receiving a placebo treatment.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

The Whitmire Micro-Gen treatment (TC-205 0.0500% Lambda-Cyhalothrin, Formula Code 191-047, Lab Code 201-096) was done on a per mound basis. The applicator wand apparatus (provided by Whitmire Micro-Gen) was inserted into the mound 6-12 inches (12 inches was preferred, but in some cases the ground was too hard). These insertions were done 4 to 8 times, depending upon the size of the mound [4 insertions for a small mound (< 6 in.) and 8 insertions for a large mound (>20 in.)]. The number of insertions for each of the mounds was documented. The product was discharged for 10 seconds during each of these insertions. The discharge occurred while the wand was being inserted and while it was withdrawn in order to promote a good distribution of product and to prevent the wand from clogging. The product was also sprayed on top of the mound for 3 seconds after the mound insertions occurred. Each of the 10 mounds were treated in this manner. No applications were done on the Placebo mounds.

- Method(s) of application: Direct, Surface
- Number of replicates per treatment: 11 mounds (10 for placebo treatment)
- Number of individuals per replicate: 1 mound
- Length of exposure to treatment (time in seconds, minutes or hours): 7 days
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): Ambient field conditions
- The type of harborage if used in the experiment: NA; specimens remained in the treated mound
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): Ant activity index taken at 30 min, 60 min, 1 day and 7 days

response to the disturbance. The index numbers from 1 to 10 represent the following estimate of the number of ants responding to the disturbance:

1 – 1 to 10 ants	6 – 100 to 150 ants
2 – 11 to 20 ants	7 – 150 to 200 ants
3 – 20 to 30 ants	8 – 200 to 250 ants
4 – 30 to 50 ants	9 – 250 to 300 ants
5 – 50 to 100 ants	10- 300 or greater ants

- Report if morbidity and mortality were recorded separately: NA; living specimens recorded
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

Mound #	Mnd Wid	Day 0	Trt	# Inser.	30 min.	60 min.	Day 1	Day 7	Excavate
	Inches	Index		of Wand	Index	Index			
1	18	8	Aerosol	8	1	0	0	0	no activity
14	10	5	Aerosol	8	1	1	4	0	no activity
16	15	5	Aerosol	8	1	1	1	0	no activity
18	12	5	Aerosol	7	1	1	4	0	no activity
21	11	5	Aerosol	7	2	2	2	0	no activity
7	12	6	Aerosol	6	1	1	0	0	no activity
4	10	4	Aerosol	5	0	0	0	0	no activity
10	10	4	Aerosol	5	1	0	2	0	no activity
20	6	5	Aerosol	5	1	0	0	0	no activity
5	6	4	Aerosol	4	0	0	0	0	no activity
12	4	3	Aerosol	4	0		0	0	no activity
			Average	6.09	0.82	0.60	1.18	0.00	
2	17	8	Placebo	N/A	7	7	7	6	activity
3	10	6	Placebo	N/A	6	6	5	4	activity
6	14	7	Placebo	N/A	5	4	3	0	no activity
8	6	5	Placebo	N/A	5	4	3	4	activity
9	12	4	Placebo	N/A	4	4	4	4	activity
11	11	5	Placebo	N/A	5	5	5	5	activity
13	12	4	Placebo	N/A	4	4	6	4	activity
15	12	6	Placebo	N/A	7	7	8	4	activity
17	12	4	Placebo	N/A	4	4	6	7	activity
19	12	6	Placebo	N/A	7	7	8	9	activity
					5.40	5.20	5.50	4.70	

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. 7 days following treatment
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Ant mound
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Direct, Surface
 - Timepoints at which corresponding control mortality is greater than 10%: NA; data based on comparison to untreated mound activity

Conclusions

- Four to eight 10-second injections of 0.05% Lambda-Cyhalothrin solution into red imported fire ant mounds caused $\geq 90\%$ reduction in average mound activity index compared to placebo treatment 7 days after application.

- The categories used for ant activity index only measure a small portion of the range of total numbers of ants in a mound. Therefore, comparison of average activity index is not an accurate measure of 90% efficacy. Because 10 is not an upper bound, the ranges are not discreet.
- (S)-Hydroprene, one of the active ingredients in the labeled formulation, was not tested in this report.
- The amount of formulation applied was not reported, therefore a.i. dose and rate information could not be calculated.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 453384-02. Efficacy of Formula Code: 191-047 in Control of Urban Pests. Kirkland, R.L. 2001.

OCSPP Product Performance Guideline: 810.3600; Guideline 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{AB}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{AB}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{AB}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, 40 CFR 158.640
MRID:	453384-02. Efficacy of Formula Code: 191-047 in Control of Urban Pests. Kirkland, R.L. 2001.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Jonathan Berger
TESTING FACILITY:	Bio Research
STUDY DIRECTOR or INVESTIGATOR:	Reed L. Kirkland, Study Director
SUBMITTER:	Dana M. Thomas, Manager, Product Registrations
STUDY COMPLETED:	16/08/2000
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was <u>NOT</u> conducted in compliance with Good Laboratory Practice Standards as described by EPA (40 CFR Parts 160 and 792), and was never intended for that purpose.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Efficacy of Formula Code: 191-047 in Control of Urban Pests.

Purpose/Objective:

This trial was conducted to assess the residual efficacy of aerosol lambda cyhalthrin (Formula 191-047) in the control of ticks, scorpions, cockroaches and centipedes. Painted wood panels were sprayed with the test material, and allowed to dry for varying times. Test organisms were then exposed to the sprayed panels, and mortality assessed.

Materials and Methods

Test Material(s):

Formula Code: 191-047
0.0500% lambda-cyhalothrin
Lab code: 201-096
June 13, 2000

Application:	Dates	Avg. Amount applied (g)
Ticks:	7-10-00	2.5
Scorpions:	7-10-00	2.3
Roaches:	7-11-00	2.5
Centipedes:		
14 DAT	8-2-00	2.1
1 DAT	8-15-00	2.1
0 DAT	8-16-00	1.6

The indicated amounts were applied to 36 square inch painted fiberboard panels at the following a.i. rates:

Ticks: 1.25 mg/36 square inches Lambda-Cyhalothrin
Scorpions: 1.15 mg/36 square inches Lambda-Cyhalothrin
Roaches: 1.25 mg/36 square inches Lambda-Cyhalothrin
Centipedes: 14 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 1 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 0 DAT: 0.8 mg/36 square inches Lambda-Cyhalothrin

(S)-Hydroprene, one of the active ingredients on the label, was not tested in the report.

Test Location: Fresno, California

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species.

Target Species:

#1	Common Name:	Brown dog tick
	Scientific Name:	<i>Rhipicephalus sanguineus</i>
	Developmental Stage:	Adult
#2	Common Name:	Bark scorpion
	Scientific Name:	<i>Centroides sculpturatus</i>
	Developmental Stage:	Adult
#3	Common Name:	German cockroach
	Scientific Name:	<i>Blattella germanica</i>
	Developmental Stage:	2 nd instar - adults
#4	Common Name:	Centipede
	Scientific Name:	<i>Scholopendra lithobius</i>
	Developmental Stage:	3 rd instar - adults

- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. See above
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.

Cockroaches and scorpions were field collected. Ticks and Centipedes were obtained from commercial insectories.

- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Formula Code: 191-047
0.0500% lambda-cyhalothrin
Lab code: 201-096
June 13, 2000

Application:	Dates	Avg. Amount applied (g)
Ticks:	7-10-00	2.5
Scorpions:	7-10-00	2.3
Roaches:	7-11-00	2.5
Centipedes:		
14 DAT	8-2-00	2.1
1 DAT	8-15-00	2.1
0 DAT	8-16-00	1.6

The indicated amounts were applied to 36 square inch painted fiberboard panels at the following a.i. rates:

Ticks: 1.25 mg/36 square inches Lambda-Cyhalothrin

Scorpions: 1.15 mg/36 square inches Lambda-Cyhalothrin

Roaches: 1.25 mg/36 square inches Lambda-Cyhalothrin

Centipedes: 14 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 1 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 0 DAT: 0.8 mg/36 square inches Lambda-Cyhalothrin

Untreated replicates consisted of exposing specimens to untreated panels

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
Prior to and after each application, the canister was weighed, so that the amount of test material applied could be documented. A direct 1 second burst of the test material was applied to 6" X 6" painted fiberboard panels, and the panels were allowed to dry. Test organisms were then exposed to the sprayed panels by trapping them on the surface, beneath 16 oz. Plastic deli cups. Mortality was assessed at 1, 4 and 24 hours of exposure. The panels were then aged indoors, in a closed cupboard for 14 days. A new cohort of test organisms was then exposed to the sprayed panels, and mortality was assessed. For testing against centipedes, panels were sprayed in advance so that the different residue ages could be tested at once.
 - Method(s) of application: Surface
 - Number of replicates per treatment:
 - Ticks: 3 reps of 10
 - Scorpions: 5 reps of 1
 - Roaches: 3 reps of 10
 - Centipedes: 5 reps of 1
 - Number of individuals per replicate: See above
 - Length of exposure to treatment (time in seconds, minutes or hours): 24 hr
 - Were tested specimens transferred to clean containers? No
 - Experimental conditions (state relative humidity, temperature, and photoperiod):
Not reported
 - The type of harborage if used in the experiment: See test apparatus description above

- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): Mortality (criteria not defined) at 1, 4 and 24 hr on panels aged 0 and 14 days
- Report if morbidity and mortality were recorded separately: Not recorded separately
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):

Raw data was analyzed using LDS, CV, and Duncan's New Multiple Range Test ($p = 0.05$) using Gyllings Agriculture Research Manager

Data Reported/Results

Table 1, continued. Percent mortality to ticks at 1, 4, and 24 hours with 0 day old residue.

Insect Code Crop Code Rating Data Type Rating Unit Trt-Eval Interval				TICK PERCENT MORTALIT 1 HOUR 0 DAT	TICK PERCENT MORTALIT 4 HOURS 0 DAT	TICK PERCENT MORTALIT 24 HOURS 0 DAT
Trt	Treatment	Form	Form	Rate		
No.	Name	Conc	Type	Rate	Unit	
1	FORMULA CODE: 191-047					
2	UNTREATED					
LSD (P=.05)				0.00	0.00	0.00
Standard Deviation				0.00	0.00	0.00
CV				0.0	0.0	0.0
Bartlett's X2				0.0	0.0	0.0
P(Bartlett's X2)				0.00	0.00	0.00
Replicate F				0.000	0.000	0.000
Replicate Prob(F)				1.0000	1.0000	1.0000
Treatment F				0.000	0.000	0.000
Treatment Prob(F)				1.0000	1.0000	1.0000

Means followed by same letter do not significantly differ ($P=.05$, Duncan's New MRT)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Table 2, continued. Percent mortality to ticks at 1, 4, and 24 hours with 14 day old residue.

Insect Code		TICK PERCENT MORTALIT	TICK PERCENT MORTALIT	TICK PERCENT MORTALIT
Crop Code		1 HOUR	4 HOURS	24 HOURS
Rating Data Type		14 DAT	14 DAT	14 DAT
Rating Unit				
Trt-Eval Interval				
Trt Treatment	Form Form			
No. Name	Conc Type Rate			
1 FORMULA CODE: 191-047		86.7 a	96.7 a	100.0 a
2 UNTREATED		0.0 b	0.0 b	0.0 b
LSD (P=.05)		14.34	14.34	0.00
Standard Deviation		4.08	4.08	0.00
CV		9.42	8.45	0.0
Bartlett's X2		0.0	0.0	0.0
P(Bartlett's X2)		0.00	0.00	0.00
Replicate F		1.000	1.000	0.000
Replicate Prob(F)		0.5000	0.5000	1.0000
Treatment F		676.000	841.000	0.000
Treatment Prob(F)		0.0015	0.0012	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Table 3, continued. Percent mortality to scorpions at 1, 4, and 24 hours with 0 day old residue.

Insect Code		SCORPION PERCENT MORTALIT	SCORPION PERCENT MORTALIT	SCORPION PERCENT MORTALIT
Crop Code		1 HOUR	4 HOURS	24 HOURS
Rating Data Type		0 DAT	0 DAT	0 DAT
Rating Unit				
Trt-Eval Interval				
Trt Treatment	Form Form			
No. Name	Conc Type Rate			
1 FORMULA CODE: 191-047		100.0 a	100.0 a	100.0 a
2 UNTREATED		0.0 b	0.0 b	0.0 b
LSD (P=.05)		0.00	0.00	0.00
Standard Deviation		0.00	0.00	0.00
CV		0.0	0.0	0.0
Bartlett's X2		0.0	0.0	0.0
P(Bartlett's X2)		0.00	0.00	0.00
Replicate F		0.000	0.000	0.000
Replicate Prob(F)		1.0000	1.0000	1.0000
Treatment F		0.000	0.000	0.000
Treatment Prob(F)		1.0000	1.0000	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Table 4, continued. Percent mortality to scorpions at 1, 4, and 24 hours with 14 day old residue.

Insect Code	SCORPION	SCORPION	SCORPION
Crop Code	PERCENT	PERCENT	PERCENT
Rating Data Type	MORTALIT	MORTALIT	MORTALIT
Rating Unit	1 HOUR	4 HOURS	24 HOURS
Trt-Eval Interval	14 DAT	14 DAT	14 DAT
Trt Treatment			
No. Name	Form Conc	Form Type	Rate Unit
1 FORMULA CODE: 191-047	0.0 a	100.0 a	60.0 a
2 UNTREATED	0.0 a	0.0 b	0.0 a
LSD (P=.05)	0.00	0.00	68.00
Standard Deviation	0.00	0.00	38.73
CV	0.0	0.0	129.1
Bartlett's X2	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	0.00
Replicate F	0.000	0.000	1.000
Replicate Prob(F)	1.0000	1.0000	0.5000
Treatment F	0.000	0.000	6.000
Treatment Prob(F)	1.0000	1.0000	0.0705

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL

Table 5, continued. Percent mortality to German cockroaches at 1, 4, and 24 hours with 0 day old residue.

Insect Code	GERMAN	GERMAN	GERMAN
Crop Code	ROACH	ROACH	ROACH
Rating Data Type	PERCENT	PERCENT	PERCENT
Rating Unit	MORTALIT	MORTALIT	MORTALIT
Crop Stage	1 HOUR	4 HOURS	24 HOURS
Trt-Eval Interval	0 DAT	0 DAT	0 DAT
Trt Treatment			
No. Name	Form Conc	Form Type	Rate Unit
1 FORMULA CODE: 191-047	100.0 a	100.0 a	100.0 a
2 UNTREATED	0.0 b	0.0 b	0.0 b
LSD (P=.05)	0.00	0.00	0.00
Standard Deviation	0.00	0.00	0.00
CV	0.0	0.0	0.0
Bartlett's X2	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	0.00
Replicate F	0.000	0.000	0.000
Replicate Prob(F)	1.0000	1.0000	1.0000
Treatment F	0.000	0.000	0.000
Treatment Prob(F)	1.0000	1.0000	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL

Table 6, continued. Percent mortality to German cockroaches at 1, 4, and 24 hours with 14 day old residue.

Insect Code	GERMAN	GERMAN	GERMAN
Crop Code	ROACH	ROACH	ROACH
Rating Data Type	PERCENT	PERCENT	PERCENT
Rating Unit	MORTALIT	MORTALIT	MORTALIT
Crop Stage	1 HOUR	4 HOURS	24 HOURS
Trt-Eval Interval	14 DAT	14 DAT	14 DAT
Trt Treatment	Form	Form	Rate
No. Name	Conc	Type	Rate Unit
1 FORMULA CODE: 191-047	63.3 a	70.0 a	66.7 a
2 UNTREATED	0.0 b	0.0 b	0.0 b
LSD (P=.05)	51.72	43.03	28.69
Standard Deviation	14.72	12.25	8.16
CV	46.48	34.99	18.84
Bartlett's X2	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	0.00
Replicate F	1.000	1.000	1.000
Replicate Prob(F)	0.5000	0.5000	0.5000
Treatment F	27.769	49.000	189.000
Treatment Prob(F)	0.0342	0.0196	0.0059

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Table 7, continued. Percent mortality to German cockroaches at 1, 4, and 24 hours with 28 day old residue.

Insect Code	GERMAN	GERMAN	GERMAN
Crop Code	ROACH	ROACH	ROACH
Rating Data Type	PERCENT	PERCENT	PERCENT
Rating Unit	MORTALIT	MORTALIT	MORTALIT
Crop Stage	1 HOUR	4 HOURS	24 HOURS
Trt-Eval Interval	28 DAT	28 DAT	28 DAT
Trt Treatment	Form	Form	Rate
No. Name	Conc	Type	Rate Unit
1 FORMULA CODE: 191-047	13.3 a	33.3 a	36.7 a
2 UNTREATED	0.0 a	0.0 a	0.0 b
LSD (P=.05)	14.34	37.95	28.69
Standard Deviation	4.06	10.80	8.16
CV	61.24	64.81	44.54
Bartlett's X2	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	0.00
Replicate F	1.000	1.000	1.000
Replicate Prob(F)	0.5000	0.5000	0.5000
Treatment F	16.000	14.286	30.250
Treatment Prob(F)	0.0572	0.0634	0.0315

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.

Table 8, continued. Percent mortality to centipedes at 1, 4, 8, and 24 hours with 0 day old residue.

Insect Code	CENTIPED	CENTIPED	CENTIPED	CENTIPED
Crop Code	PERCENT	PERCENT	PERCENT	PERCENT
Rating Data Type	MORTALIT	MORTALIT	MORTALIT	MORTALIT
Rating Unit	1 HOUR	4 HOURS	8 HOURS	24 HOURS
Trt-Eval Interval	0 DAT	0 DAT	0 DAT	0 DAT
Trt Treatment				
No. Name	Form Conc	Form Type	Rate	Unit
1 FORMULA CODE: 191-047	20.0 a	80.0 a	80.0 a	100.0 a
2 UNTREATED	0.0 a	0.0 b	20.0 a	40.0 a
LSD (P=.05)	55.52	55.52	68.00	68.00
Standard Deviation	31.62	31.62	38.73	38.73
CV	316.23	79.06	77.46	55.33
Bartlett's X2	0.0	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	1.00	0.00
Replicate F	1.000	1.000	1.667	1.000
Replicate Prob(F)	0.5000	0.5000	0.3164	0.5000
Treatment F	1.000	16.000	6.000	6.000
Treatment Prob(F)	0.3739	0.0161	0.0705	0.0705

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL

Table 9, continued. Percent mortality to centipedes at 1, 4, 8, and 24 hours with 1 day old residue.

Insect Code	CENTIPED	CENTIPED	CENTIPED	CENTIPED
Crop Code	PERCENT	PERCENT	PERCENT	PERCENT
Rating Data Type	MORTALIT	MORTALIT	MORTALIT	MORTALIT
Rating Unit	1 HOUR	4 HOURS	8 HOURS	24 HOURS
Trt-Eval Interval	1 DAT	1 DAT	1 DAT	1 DAT
Trt Treatment				
No. Name	Form Conc	Form Type	Rate	Unit
1 FORMULA CODE: 191-047	20.0 a	60.0 a	100.0 a	100.0 a
2 UNTREATED	0.0 a	0.0 a	20.0 b	40.0 a
LSD (P=.05)	55.52	68.00	55.52	68.00
Standard Deviation	31.62	38.73	31.62	38.73
CV	316.23	129.1	52.7	55.33
Bartlett's X2	0.0	0.0	0.0	0.0
P(Bartlett's X2)	0.00	0.00	0.00	0.00
Replicate F	1.000	1.000	1.000	1.000
Replicate Prob(F)	0.5000	0.5000	0.5000	0.5000
Treatment F	1.000	6.000	16.000	6.000
Treatment Prob(F)	0.3739	0.0705	0.0161	0.0705

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL

Table 10, continued. Percent mortality to centipedes at 1, 4, 8, and 24 hours with 14 day old residue.

Insect Code	CENTIPED	CENTIPED	CENTIPED	CENTIPED
Crop Code	PERCENT	PERCENT	PERCENT	PERCENT
Rating Data Type	MORTALIT	MORTALIT	MORTALIT	MORTALIT
Rating Unit	1 HOUR	4 HOURS	8 HOURS	24 HOURS
Trt-Eval Interval	14 DAT	14 DAT	14 DAT	14 DAT
Trt Treatment				
No. Name				
1 FORMULA CODE: 191-047	0.0 a	20.0 a	80.0 a	80.0 a
2 UNTREATED	0.0 a	0.0 a	20.0 a	40.0 a
LSD (P=.05)	0.00	55.52	68.00	68.00
Standard Deviation	0.00	31.62	38.73	38.73
CV	0.0	316.23	77.46	64.55
Bartlett's X2	0.0	0.0	0.0	0.154
P(Bartlett's X2)	0.00	0.00	1.00	0.695
Replicate F	0.000	1.000	1.667	2.333
Replicate Prob(F)	1.0000	0.5000	0.3164	0.2160
Treatment F	0.000	1.000	6.000	2.667
Treatment Prob(F)	1.0000	0.3739	0.0705	0.1778

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL

- Deviations or amendments from the protocol.
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Ticks: 1, 4, and 24 hr 0 days after treatment and at 4 and 24 hr 14 days after treatment. Scorpions: 1, 4, and 24 hr 0 days after treatment and 4 hr 14 days after treatment. German cockroach: 1, 4 and 24 hr 0 days after treatment. Centipede: 24 hr 0 days after treatment, 8 and 24 hr 1 day after treatment.
 - Tested a.i. application rate:

Ticks: 1.25 mg/36 square inches Lambda-Cyhalothrin

Scorpions: 1.15 mg/36 square inches Lambda-Cyhalothrin

Roaches: 1.25 mg/36 square inches Lambda-Cyhalothrin

Centipedes: 14 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 1 DAT: 1.05 mg/36 square inches Lambda-Cyhalothrin, 0 DAT: 0.8 mg/36 square inches Lambda-Cyhalothrin

- Surface tested, for residual studies (e.g. ceramic tile, wood panel): Painted fiberboard panel
- Formulation type (e.g. aerosol, granular): Aerosol
- Application type (e.g. direct, surface, area): Surface
- Timepoints at which corresponding control mortality is greater than 10%: Centipede at 8 (20%) and 24 hr (40%) 0, 1 and 14 days after treatment

Conclusions

- Application of Lambda-Cyhalothrin at 1.25 mg/36 square inches Lambda-Cyhalothrin caused $\geq 90\%$ mortality to ticks at 1, 4, and 24 hr 0 days after treatment and at 4 and 24 hr 14 days after treatment.
- Application of Lambda-Cyhalothrin at 1.15 mg/36 square inches Lambda-Cyhalothrin caused $\geq 90\%$ mortality to scorpions at 1, 4, and 24 hr 0 days after treatment and 4 hr 14 days after treatment.
- Application of Lambda-Cyhalothrin at 1.25 mg/36 square inches Lambda-Cyhalothrin caused $\geq 90\%$ mortality to German cockroach at 1, 4 and 24 hr 0 days after treatment.
- Application of Lambda-Cyhalothrin at 0.8 mg/36 square inches Lambda-Cyhalothrin caused $\geq 90\%$ mortality to centipede at 24 hr 0 days after treatment, and 1.05 mg/36 square inches Lambda-Cyhalothrin caused $\geq 90\%$ mortality at 8 and 24 hr 1 day after treatment.
- The fact that the control mortality for centipede at 0, 1 and 14 days after treatment were identical demonstrates that one control was conducted for all three time points.
- (S)-Hydroprene, one of the active ingredients on the label, was not tested in the report.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 456672-03. Performance of Chemsico RTU Insecticide L EPA Reg. No. 9688- against House Flies, Subterranean Termites, American Cockroaches, German Cockroaches, Deer Ticks, House Crickets, Mosquitoes, Black Carpenter Ants, Harvester Ants, Red Carpenter Ants, and Cat Fleas. Morris, J.A. 2002.

OCSPP Product Performance Guideline: 810.3600; Guideline 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson¹⁵
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess¹⁵
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross¹⁵
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds¹⁵
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, Guideline 158.640
MRID:	456672-03. Performance of Chemsico RTU Insecticide L EPA Reg. No. 9688- against House Flies, Subterranean Termites, American Cockroaches, German Cockroaches, Deer Ticks, House Crickets, Mosquitoes, Black Carpenter Ants, Harvester Ants, Red Carpenter Ants, and Cat Fleas. Morris, J.A. 2002.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Charles A. Duckworth
TESTING FACILITY:	United Industries Corp., 8825 Page Blvd., St. Louis, MO 63114
STUDY DIRECTOR or INVESTIGATOR:	Paul L. Schoenberg, Study Director
SUBMITTER:	Kathy J. Tryson,
STUDY COMPLETED:	18/03/2002
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	<p>The study detailed in this report was not conducted fully under the Good Laboratory Practice Regulations, 40 CFR Part 160, pursuant to Section 160.3, <i>Study</i>.</p> <p>The Good Laboratory Practice Regulations do not require a Product Performance Study to be conducted under GLP Guidelines unless it is specifically required under Section 158.640 (Only Antimicrobial and Vertebrate Control Agents are listed). This study does not fall into that category.</p> <p>The following items within the Good Laboratory Practice Guidelines were not followed:</p> <p>--No Quality Assurance Audit was conducted during the conduct of the study.</p> <p>--Protocols were not approved in writing prior to the initiation of the study.</p>
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol

EPA REGISTRATION NUMBER OR FILE SYMBOL:
89459-IU

ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin,
(S)-Hydroprene

CHEMICAL NAME: Not provided

A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene
0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Performance of Chemsico RTU Insecticide L EPA Reg. No. 9688- against House Flies, Subterranean Termites, American Cockroaches, German Cockroaches, Deer Ticks, House Crickets, Mosquitoes, Black Carpenter Ants, Harvester Ants, Red Carpenter Ants, and Cat Fleas.

Purpose/Objective:

To measure knockdown and kill of crawling insects by approximating normal consumer use of aerosol products, under laboratory conditions.

Materials and Methods

Test Material(s): Chemsico RTU Insecticide L, 0.002% Lambda-Cyhalothrin

3 g of the formulation was applied directly to the test insects, delivering an a.i. dose of 0.06 mg Lambda-Cyhalothrin

(S)-Hydroprene, one of the active ingredients on the label, was not evaluated in this study.

Test Location: St. Louis, Missouri

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*; American cockroach, *Periplaneta americana*; house cricket, *Acheta domesticus*; mosquito (Culicidae, genus and species not provided); subterranean termite (Rhinotermitidae, genus and species not provided); black carpenter ant, *Camponotus pennsylvanicus*; red carpenter ant, *Camponotus chromaiodes*; harvester ant (Formicidae, genus and species not identified); house fly, *Musca domestica*; cat flea, *Ctenocephalides felis*; deer tick, *Ixodes scapularis*.
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Not specified except as male for German cockroach
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.
German Male Cockroaches, American Cockroaches, House Crickets, and Mosquitoes obtained from United Industries.
Subterranean Termites, Black Carpenter Ants, Red Carpenter Ants, Harvester Ants and House Flies obtained from Carolina Biological Supply Co.
Cat Fleas obtained from El Labs.
Deer Ticks obtained from Oklahoma State University.
- If female adults are used - are they gravid? Not reported or NA
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Chemsico RTU Insecticide L, 0.002% Lambda-Cyhalothrin

3 g of the formulation was applied directly to the test insects, delivering an a.i. dose of 0.06 mg Lambda-Cyhalothrin

(S)-Hydroprene, one of the active ingredients on the label, was not evaluated in this study.

Untreated control replicates are not described or reported.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
Spray Test Cups – 5” Stainless Steel sieve, #10 mesh, or similar, clear covers
Teflon Emulsion
Holding Cups – Clean paper or plastic, with clear covers, or similar
Place 5 – 10 insects into each test cup and cover with appropriate lid.
With good ventilation under a fume hood or similar area, uncover roaches. Using a slight circular motion, spray each test cup from a distance of 8 – 12 inches, depending on spray pattern and discharge rate of the unit. A 1g. dose rate should approximate a light wetting of all insects in the test cup. A 3g. dose rate should produce a heavy wetting of all insects. Record actual amount of spray discharge after each application. (Note: The above spraying should approximate normal use pattern and application of the aerosol product.)
 - Method(s) of application: Direct spray
 - Number of replicates per treatment: 3 (5 for house fly)
 - Number of individuals per replicate: 9 to 10 (house fly), 11 to 14 (termite), 5 (American cockroach, deer tick, house cricket) 8 (German cockroach), 4 to 5 (mosquito), 10 (black carpenter ant, harvester ant, red carpenter ant), 7 to 12 (cat flea)
 - Length of exposure to treatment (time in seconds, minutes or hours): 0 min
 - Were tested specimens transferred to clean containers? Yes
 - Experimental conditions (state relative humidity, temperature, and photoperiod): Not reported
 - The type of harborage if used in the experiment: See test apparatus description above
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):
holding cups, and cover. Evaluate and record knockdown (inability to move in a consistent manner) times KT_{50} (50% of population down) and KT_{90} (90% of population down). Evaluate insects for 24 hour kill and record. (Note: If knockdown times are expected to be less than 30 seconds and 24 hour kill is not being evaluated, insects need not be transferred to holding cups).
 - Report if morbidity and mortality were recorded separately: Not recorded separately
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence

intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

Table I. Efficacy of Chemsico RTU Insecticide L Against A Number of Household Pests In a 3 Gram Direct Spray Test

	Insect	Grams Applied	Time	Initial Results	24 hr. kill
Rep 1	House Fly	3.22	5min 29sec	10/10	10/10
Rep 2	House Fly	3.20	3min 56sec	10/10	10/10
Rep 3	House Fly	3.21	4min 10sec	10/10	10/10
Rep 4	House Fly	3.12	4min 14sec	9/9	9/9
Rep 5	House Fly	3.30	2min 53sec	9/9	9/9
Rep 1	Termites	3.16	10min 49sec	13/13	13/13
Rep 2	Termites	3.15	10min 19sec	11/11	11/11
Rep 3	Termites	2.99	9min 57sec	14/14	14/14
Rep 1	American Roach	3.20	15 min	3/5	5/5
Rep 2	American Roach	2.94	25 min	0/5	5/5
Rep 3	American Roach	3.14	15min	2/5	5/5
Rep 1	German Roach	3.12	13min 3sec	8/8	8/8
Rep 2	German Roach	2.95	11min 59sec	8/8	8/8
Rep 3	German Roach	2.89	13min 39sec	8/8	8/8
Rep 1	Deer Ticks	2.97	7min 5sec	5/5	5/5
Rep 2	Deer Ticks	2.96	9min 29sec	5/5	5/5
Rep 3	Deer Ticks	3.07	7min 49sec	5/5	5/5
Rep 1	House Crickets	3.00	8min 40sec	5/5	5/5
Rep 2	House Crickets	2.99	11min 20sec	5/5	5/5
Rep 3	House Crickets	2.91	5min 26sec	5/5	5/5
Rep 1	Mosquitoes	2.99	1min 54sec	5/5	5/5
Rep 2	Mosquitoes	3.05	2min 29sec	5/5	5/5
Rep 3	Mosquitoes	2.91	4min 5sec	4/4	4/4
Rep 4	Mosquitoes	2.98	2min 17sec	5/5	5/5
Rep 1	Blk Carpenter Ants	2.99	7min 3sec	10/10	10/10
Rep 2	Blk Carpenter Ants	3.04	9min 6sec	10/10	10/10
Rep 3	Blk Carpenter Ants	3.01	9min 9sec	10/10	10/10
Rep 1	Cat Fleas	3.07	11min 12sec	12/12	12/12
Rep 2	Cat Fleas	3.01	8min 31sec	7/7	7/7
Rep 3	Cat Fleas	3.15	9min 56sec	8/8	8/8
Rep 1	Harvester Ants	3.13	8min 7sec	10/10	10/10
Rep 2	Harvester Ants	3.07	8min 29sec	10/10	10/10
Rep 3	Harvester Ants	3.09	9min 36sec	10/10	10/10
Rep 1	Red Carpenter Ants	2.97	9min 54sec	10/10	10/10
Rep 2	Red Carpenter Ants	3.02	9min 20sec	10/10	10/10
Rep 3	Red Carpenter Ants	3.15	9min 15sec	10/10	10/10

The “Time” column was not defined in the report and could refer to time to 50% or 90% knockdown. It is also unclear to what “Initial Results” represent.

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed.
Mortality: 24 hr for all species
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): NA
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Direct
 - Timepoints at which corresponding control mortality is greater than 10%:
Control data not reported

Conclusions

- Direct application of 3 g Chemsico RTU Insecticide L to deliver 0.06 mg Lambda-Cyhalothrin caused $\geq 90\%$ mortality within 24 hr to all species tested.
- Untreated control replicates were not described or reported.
- (S)-Hydroprene, one of the active ingredients on the label, was not evaluated in this study.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 457190-01. Evaluation of Gentrol® for Efficacy against Bed Bugs. Spero, N.C. 2002.

OCSPP Product Performance Guideline: 810.3600

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AS}
Date: 05/31/2014

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AS}
Date: 05/31/2014

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AS}
Date: 05/31/2014

Quality Assurance:
Angela M. Edmonds, B.S.

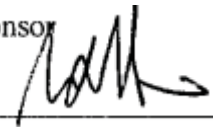
Signature: Angela M. Edmonds
Date: 05/31/2014

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600
MRID:	457190-01. Evaluation of Gentrol® for Efficacy against Bed Bugs. Spero, N.C. 2002.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Sponsor  [Illegible]
TESTING FACILITY:	Insect Control and Research, 1330 Dillon Heights Avenue, Baltimore, MD 21228
STUDY DIRECTOR or INVESTIGATOR:	Nicketas C. Spero, Study Director
SUBMITTER:	Gary R. Sandberg, Federal Regulatory Project Manager
STUDY COMPLETED:	03/05/2002
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study does not meet the requirements of 40 CFR part 160.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Evaluation of Gentrol® for Efficacy against Bed Bugs.

Purpose/Objective:

To evaluate the efficacy of Gentrol® applied to wood for control of bedbugs.

Materials and Methods

Test Material(s): Gentrol (active ingredient identity and concentration were not reported), applied at a rate of 1 gallon/1500 square feet to 3-inch diameter wooden disks.

There is no indication in the report if Gentrol contains either of the labeled active ingredients.

Test Location: Baltimore, MD

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. Bed bug, *Cimex lectularius*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Mid to late instars
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains. ICR colony
- If female adults are used - are they gravid? NA; nymphs used
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Gentrol (active ingredient identity and concentration were not reported), applied at a rate of 1 gallon/1500 square feet to 3-inch diameter wooden disks.

There is no indication in the report if Gentrol contains either of the labeled active ingredients.

Untreated controls consisted of five replications of insects exposed to untreated wood disks.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
Five wood discs will be treated with the diluted Gentrol® with a direct spray method. The discs will be attached to the bottom of containers. Twenty mid to late instar bed bugs will be released in each container and the caps sealed in place. Five additional replicates with untreated discs will be prepared for control replicates. The bed bugs will be blood fed on rabbits once weekly. The study will continue until one week after the F₁ generation is observed in the control replicates.
 - Method(s) of application: Surface
 - Number of replicates per treatment: 5
 - Number of individuals per replicate: 20
 - Length of exposure to treatment (time in seconds, minutes or hours): 8 weeks
 - Were tested specimens transferred to clean containers? No
 - Experimental conditions (state relative humidity, temperature, and photoperiod):
Not reported
 - The type of harborage if used in the experiment: See test apparatus description above
 - The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move): Time until one week beyond F₁ generation observed in control replications. Eggs, nymphs and adults compared between treatment and control replications.
 - Report if morbidity and mortality were recorded separately: NA; living specimens observed
 - Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):
Data will be analyzed with appropriate statistical tests to discriminate between production of adults and F₁ nymphs in the treated and control containers. This analysis is normally done by Analysis of Variance (ANOVA), followed by Duncan's New Multiple Range Test or an equivalent procedure.

Data Reported/Results

Treatment	Rep	Eggs	ANOVA Grp*	Nymphs	ANOVA Grp*	Adults	ANOVA Grp*
Control	1	122		67		18	
	2	101		61		17	
	3	103		65		18	
	4	44		22		21	
	5	97		51		16	
	AVE	93.4	a	53.2	a	18	a
Test	1	72		28		18	
	2	20		12		17	
	3	5		4		12	
	4	45		23		16	
	5	11		9		15	
	Ave	30.6	b	15.2	b	15.6	a

* Like letters show no statistical difference, different letters show statistically significant difference

Table 1. Counts of bedbug eggs, nymphs and adults after eight weeks.

- Deviations or amendments from the protocol. None
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Not observed
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Wooden disk
 - Formulation type (e.g. aerosol, granular): Liquid
 - Application type (e.g. direct, surface, area): Surface
 - Timepoints at which corresponding control mortality is greater than 10%: NA; living specimens recorded

Conclusions

- Application of Gentrol to wooden disks did not cause $\geq 90\%$ reduction in numbers of eggs, nymphs, or adults relative to control treatments within 8 weeks.
- The identity and concentration of the Gentrol active ingredients are not reported.
- There is no indication in the report if the material tested contains the labeled active ingredients.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 457309-01. Residual Product Performance of Chemsico Home Insect Control 3L
EPA Reg. No. 9688-176 against Male German Roaches, Black Carpenter Ants, House
Crickets, and Cat Fleas. Morris, J.A. 2002.

OCSPP Product Performance Guideline: 810.3600, Guideline 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AS}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AS}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AS}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, Guideline 158.640
MRID:	457309-01. Residual Product Performance of Chemsico Home Insect Control 3L EPA Reg. No. 9688-176 against Male German Roaches, Black Carpenter Ants, House Crickets, and Cat Fleas. Morris, J.A. 2002.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Charles A. Duckworth, Sponsor
TESTING FACILITY:	United Industries Corp., 8825 Page Blvd., St. Louis, MO 63114
STUDY DIRECTOR or INVESTIGATOR:	Paul L. Schoenberg, Study Director
SUBMITTER:	Kathie J. Tryson, Director, Pesticide Regulatory Affairs
STUDY COMPLETED:	11/07/2002
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	<p>The study detailed in this report was not conducted fully under the Good Laboratory Practice Regulations, 40 CFR Part 160, pursuant to Section 160.3, <i>Study</i>.</p> <p>The Good Laboratory Practice Regulations do not require a Product Performance Study to be conducted under GLP Guidelines unless it is specifically required under Section 158.640 (Only Antimicrobial and Vertebrate Control Agents are listed). This study does not fall into that category.</p> <p>The following items within the Good Laboratory Practice Guidelines were not followed:</p> <p>--No Quality Assurance Audit was conducted during the conduct of the study.</p> <p>--Protocols were not approved in writing prior to the initiation of the study.</p>
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU

ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin,
(S)-Hydroprene

CHEMICAL NAME: Not provided

A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene
0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Residual Product Performance of Chemsico Home Insect Control 3L EPA Reg. No. 9688-176 against Male German Roaches, Black Carpenter Ants, House Crickets, and Cat Fleas.

Purpose/Objective:

To measure knockdown and kill of crawling insects when exposed to a dry deposit of insecticidal product.

Materials and Methods

Test Material(s): Chemsico Home Insect Control 3L, assayed at 0.0303% Lambda-Cyhalothrin.

A mean of 0.70 g of the product was applied 36 square-inch vinyl tiles at an a.i. rate of 1.4 mg Lambda-Cyhalothrin/ft².

(S)-Hydroprene, the other active ingredient in the labeled formulation, was not tested in this study.

Test Location: St. Louis, Missouri

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*; black carpenter ant, *Camponotus pennsylvanicus*; house cricket, *Acheta domesticus*; cat flea, *Ctenocephalides felis*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. German cockroach: male. Not reported for other species.
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.
German male cockroaches obtained from United Industries.
Black Carpenter Ants received from Carolina Biological Supply.
House Crickets received from a local source.
Cat Fleas received from EL Labs.
- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Chemsico Home Insect Control 3L, assayed at 0.0303% Lambda-Cyhalothrin.

A mean of 0.74 g of the product was applied 36 square-inch vinyl tiles at an a.i. rate of 0.22 mg/36 square inches Lambda-Cyhalothrin.

(S)-Hydroprene, the other active ingredient in the labeled formulation, was not tested in this study.

Untreated control replications consisted of specimens exposed to nontreated tiles.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
Vinyl tile, 6" square
Petri dishes, 5.5" (150 x 15 mm) diameter (30 sq. in.) clear glass or plastic
Place 5 – 10 insects onto each petri dish and cover with a 6" square of untreated vinyl tile. Invert holding chamber so that the tile becomes the floor of the chamber.
Pre-treat pieces of test tiles with test material. Test material may be sprayed or spread onto the tile surface. Amount of test material used will vary depending on labeled use rates. Generally, the tile will be treated to the point of run-off. Weigh the tile before and after application of the test material. Record weight. Let tiles dry overnight under ambient storage conditions.
Place the treated tiles next to and against the holding chamber tiles. Gently tap down any insects which may be on the petri dish. Slowly slide the petri dish from the untreated tile to the treated tile, being careful not to injure the test insects. Start timer. Expose the insects a predetermined length of time, usually 15 minutes to one hour exposure. Record knockdown (inability to move in a consistent manner), if

○ Method(s) of application: Surface
○ Number of replicates per treatment: 5
○ Number of individuals per replicate: 10 for all species except house cricket = 5
○ Length of exposure to treatment (time in seconds, minutes or hours): 4 hr
○ Were tested specimens transferred to clean containers? Yes
○ Experimental conditions (state relative humidity, temperature, and photoperiod): 80°F and 52% RH
○ The type of harborage if used in the experiment: See test apparatus description above
○ The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):
hour exposure. Record knockdown (inability to move in a consistent manner), if any, at 15 minute intervals. After full exposure time, slowly slide the petri dish back to the untreated tile. Hold insects for 24 hours and record kill.

○ Report if morbidity and mortality were recorded separately: Not recorded separately
○ Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Not performed

Data Reported/Results

Table II. Residual Efficacy of Chemsico Home Insect Control 3L
Against German Male Cockroaches, Black Carpenter Ants, House Crickets, and Cat Fleas.

Tile number	Time 0 German Roaches	5 months German Roaches	7months German Roaches	9months German Roaches	9 months Black Carpenter Ants	9 months House Crickets	9 months Cat Fleas
A1	10/10	10/10	10/10	10/10	10/10	5/5	11/11
A2	10/10	10/10	10/10	10/10	10/10	5/5	7/10
A3	10/10	10/10	10/10	10/10	10/10	5/5	11/12
A4	10/10	10/10	10/10	10/10	10/10	5/5	4/6
A5	10/10	10/10	10/10	10/10	10/10	5/5	10/10
Control A	0/10	0/10	0/10	0/10	0/10	0/5	0/10
B1	10/10	10/10	10/10	10/10	10/10	5/5	8/11
B2	10/10	10/10	10/10	10/10	10/10	5/5	9/11
B3	10/10	10/10	10/10	10/10	10/10	5/5	11/12
B4	10/10	10/10	10/10	10/10	10/10	5/5	11/12
B5	10/10	10/10	10/10	10/10	10/10	5/5	11/11
Control B	0/10	0/10	0/10	0/10	0/10	0/5	0/14
C1	10/10	10/10	10/10	10/10	10/10	5/5	9/11
C2	10/10	10/10	10/10	10/10	10/10	5/5	7/9
C3	10/10	10/10	10/10	10/10	10/10	5/5	10/12
C4	10/10	10/10	10/10	10/10	10/10	5/5	9/10
C5	10/10	10/10	10/10	10/10	10/10	5/5	9/11
Control C	0/10	0/10	0/10	0/10	4/10	0/5	0/11
% kill on treated tiles	100%	100%	100%	100%	100%	100%	92%

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Knockdown: 24 hr following 4 hr exposure to all species at all aging times
 - Tested a.i. application rate: 0.22 mg/36 square inches Lambda-Cyhalothrin
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Vinyl tile
 - Formulation type (e.g. aerosol, granular): Liquid
 - Application type (e.g. direct, surface, area): Surface
 - Timepoints at which corresponding control mortality is greater than 10%: Not observed

Conclusions

- Application of Chemsico Home Insect Control 3L at 1.4 mg Lambda-Cyhalothrin/ft² Lambda-Cyhalothrin caused $\geq 90\%$ mortality within 24 hr following 4 hr exposure of German cockroach 0, 5, 7 and 9 months after treatment and of black carpenter ant, house cricket and cat flea 9 months after treatment.
- (S)-Hydroprene, the other active ingredient in the labeled formulation, was not tested in this study.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 458629-01. Evaluation of Residues of Lambda-Cyhalothrin Compared to D-Force™ HPX in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Larvae, and Field Cricket. Cardoza, R., Kirkland, R. 2003.

OCSPP Product Performance Guideline: 810.3600, 40 CFR 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{AS}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{AS}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{AE}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, 40 CFR 158.640
MRID:	458629-01. Evaluation of Residues of Lambda-Cyhalothrin Compared to D-Force™ HPX in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Larvae, and Field Cricket. Cardoza, R., Kirkland, R. 2003.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Jonathan Berger, Sponsor
TESTING FACILITY:	Bio Research, 1738 N. Fowler Avenue, Fresno, CA 93727
STUDY DIRECTOR or INVESTIGATOR:	Reed L. Kirkland, Study Director
SUBMITTER:	Dana M. Thomas, Manager, Product Registrations
STUDY COMPLETED:	18/11/2002
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was <u>NOT</u> conducted in compliance with Good Laboratory Practice Standards as described by EPA (40 CFR Parts 160 and 792), and was never intended for that purpose.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Evaluation of Residues of Lambda-Cyhalothrin Compared to D-Force™ HPX in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Larvae, and Field Cricket.

Purpose/Objective:

This test was conducted to evaluate residues of Lambda-Cyhalothrin, applied to tile and wood surfaces, in the control of the German cockroach, American cockroach, Argentine ant, confused flour beetle, Indian meal moth larvae, and field cricket. The trial was conducted in conjunction with other testing, sharing data from the standard, D-Force™ HPX, and the untreated plots.

Materials and Methods

Test Material(s):

0.0500% Lambda-Cyhalothrin
Formula Code: 215-006
TC-241 Lab Code: 215-017

D-Force™ HPX
0.06% Deltamethrin
Lot No. 343273 0201044
EPA Reg. No. 9444-217 EPA Est. No. 9444-LA-1

The product was applied to tiles at a rate of 14.9 g product/ft² (7.46 mg lambda-cyhalothrin/ft²) for German cockroaches and 13.43 g product/ft² (6.7 mg lambda-cyhalothrin/ft²) for American cockroaches and to particle board at a rate of 12 g product/ft² (6 mg lambda-cyhalothrin/ft²) for both German and American cockroaches.

A mean of 1.15 g of the products were applied to 9.6 square inch vinyl tile at a.i. rates of 0.6 mg/9.6 square inches Lambda-Cyhalothrin or 0.7 mg/9.6 square inches Deltamethrin.

A mean of 2.88 g of each formulation was applied to 36 square inch wood panels at a.i. rates of 1.4 mg/36 square inches Lambda-Cyhalothrin or 1.7 mg/36 square inches Deltamethrin.

(S)-Hydroprene, one of the active ingredients on the label, was not tested in this report.

Test Location: Fresno, California

Positive Control/Reference Standard, if used: D-Force, 0.06% Deltamethrin applied as described above

Species Tested:

- Common name and scientific name of each species.

Common Name: German cockroach
Scientific Name: *Blattella germanica*
Developmental Stage: Nymphs and adults

Common Name: American cockroach
Scientific Name: *Periplaneta americana*
Developmental Stage: Nymphs and adults

Common Name: Argentine ant
Scientific Name: *Linepithema humile*
Developmental Stage: Adult workers

Common Name: Confused flour beetle
Scientific Name: *Tribolium confusum*
Developmental Stage: Adults

Common Name: Indian meal moth
Scientific Name: *Plodia interpunctella*
Developmental Stage: 2nd-4th instar larvae

Common Name: Field cricket
Scientific Name: *Gryllus* (= *Acheta assimilis*)
Developmental Stage: Adults

- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. See table above
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.

The cockroaches used in the trial were from laboratory colonies maintained at the Bio Research facility. The Argentine ants were field-collected at the Bio Research facility. The remaining insects were obtained from various commercial insectories.

- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

0.0500% Lambda-Cyhalothrin
Formula Code: 215-006
TC-241 Lab Code:215-017

D-Force™ HPX
0.06% Deltamethrin
Lot No. 343273 0201044
EPA Reg. No. 9444-217 EPA Est. No. 9444-LA-1

A mean of 1.15 g of the products were applied to 9.6 square inch vinyl tile at a.i. rates of 0.6 mg/9.6 square inches Lambda-Cyhalothrin or 0.7 mg/9.6 square inches Deltamethrin.

A mean of 2.88 g of each formulation was applied to 36 square inch wood panels at a.i. rates of 1.4 mg/36 square inches Lambda-Cyhalothrin or 1.7 mg/36 square inches Deltamethrin.

(S)-Hydroprene, one of the active ingredients on the label, was not tested in this report.

Untreated control replicates consisted of specimens exposed to untreated surfaces.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

Tile

Armstrong Vernay Series Vinyl No-Wax Tile was mounted at the bottom of 16-ounce (German cockroach, Argentine ant, confused flour beetle, and Indian meal moth larvae) or 32-ounce (American cockroach and field cricket) plastic deli cups (9.6 sq. inch surface area). Fluon® was painted on the inside walls of the cups, as needed, to insure that the test organisms remained in contact with the sprayed surfaces. Deli cup lids were placed on the cups, and water was provided via a saturated cotton ball.

Wood

Six-inch squares (36 sq. inch surface area) of particle-board (Handi-panel, U.S.A.) were used as a substrate. The insects were held under inverted deli cups with Fluon® painted on the inside walls of the cups, as needed, to insure that the test organisms remained in contact with the sprayed surfaces. Water was provided via a saturated cotton ball.

- Method(s) of application: Surface
- Number of replicates per treatment:

Replication No. & Units:

German cockroach:	4 replicates of 5 roaches
American cockroach:	4 replicates of 5 roaches
Argentine ant:	4 replicates of 10 ants
Confused flour beetle:	4 replicates of 5 beetles
Indian meal moth larvae:	4 replicates of 10 larvae
Field cricket:	4 replicates of 5 crickets

- Number of individuals per replicate: See above
- Length of exposure to treatment (time in seconds, minutes or hours): 1, 4 and 24 hr
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): Not reported for testing, only for aging of surfaces
- The type of harborage if used in the experiment: See test apparatus description above
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

Evaluations were conducted at 1, 14, and 28 days post-treatment, by placing the insects into the test cages. Water was provided via

a saturated cotton ball. Knockdown (inability to upright and maintain coordinated movement) was assessed at 1, 4, and 24 hours of exposure.

- Report if morbidity and mortality were recorded separately: Not recorded separately
- Statistical analysis conducted and justification for selecting the approach to data

analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):

Mortality was analyzed using LSD, CV, and Duncan's New Multiple Range Test ($p = 0.05$) using Gyllings Agriculture Research Manager program.

Data Reported/Results

Table 3, continued. Percent dead German cockroaches after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN
Crop Code	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment									
No. Name									
13 LAMBDA ONLY	100.0 a	100.0 a	100.0 a	95.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
12 D-FORCE HPX	100.0 a	100.0 a	100.0 a	90.0 a	95.0 a	100.0 a	100.0 a	100.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	0.00	0.00	0.00	17.30	9.990	0.00	0.00	0.00	0.00
Standard Deviation	0.00	0.00	0.00	10.00	5.774	0.00	0.00	0.00	0.00
CV	0.0	0.0	0.0	16.22	8.88	0.0	0.0	0.0	0.0
Bartlett's X2	0.0	0.0	0.0	0.059	0.0	0.0	0.0	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.00*	0.809	0.00*	0.00*	0.00*	0.00*	0.00*
Replicate F	0.000	0.000	0.000	0.333	1.000	0.000	0.000	0.000	0.000
Replicate Prob(F)	1.0000	1.0000	1.0000	0.8022	0.4547	1.0000	1.0000	1.0000	1.0000
Treatment F	0.000	0.000	0.000	114.333	381.000	0.000	0.000	0.000	0.000
Treatment Prob(F)	1.0000	1.0000	1.0000	0.0001	0.0001	1.0000	1.0000	1.0000	1.0000

Means followed by same letter do not significantly differ ($P=.05$, Duncan's New MRT)

Table 5, continued. Percent dead German cockroaches after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN	GERMAN
Crop Code	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Post Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment									
No. Name									
13 LAMBDA ONLY	30.0 a	50.0 a	60.0 a	35.0 a	100.0 a	100.0 a	65.0 a	65.0 a	90.0 a
12 D-FORCE HPX	35.0 a	35.0 a	55.0 a	40.0 a	65.0 b	95.0 a	45.0 b	75.0 a	85.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 a	0.0 c	0.0 b	0.0 c	0.0 b	0.0 b
LSD (P=.05)	23.78	23.78	15.26	41.19	9.99	9.99	19.13	17.30	17.30
Standard Deviation	13.74	13.74	8.82	23.80	5.77	5.77	11.06	10.00	10.00
CV	63.43	48.51	23.01	95.22	10.5	8.88	30.15	18.75	17.14
Bartlett's X2	2.246	0.25	0.858	1.425	0.0	0.0	1.124	0.0	0.069
P(Bartlett's X2)	0.134	0.617	0.417	0.233	0.00*	0.00*	0.289	1.00	0.809
Replicate F	2.059	3.471	2.714	0.529	1.000	1.000	1.818	0.000	0.333
Replicate Prob(F)	0.2072	0.0910	0.1377	0.5784	0.4547	0.4547	0.2442	1.0000	0.8022
Treatment F	7.588	13.941	57.000	3.353	309.000	381.000	36.273	86.333	102.333
Treatment Prob(F)	0.0227	0.0056	0.0001	0.1063	0.0001	0.0001	0.0004	0.0001	0.0001

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 7, continued. Percent dead American cockroaches after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN
Crop Code	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Post Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment									
No. Name									
13 LAMBDA ONLY	95.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	65.0 a	100.0 a	100.0 a
12 D-FORCE HPX	100.0 a	100.0 a	100.0 a	90.0 a	100.0 a	100.0 a	65.0 a	100.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	9.99	0.00	0.00	19.98	0.00	0.00	36.02	0.00	0.00
Standard Deviation	5.77	0.00	0.00	11.55	0.00	0.00	20.82	0.00	0.00
CV	8.88	0.0	0.0	18.23	0.0	0.0	48.04	0.0	0.0
Bartlett's X2	0.0	0.0	0.0	0.0	0.0	0.0	0.21	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.647	0.00*	0.00*
Replicate F	1.000	0.000	0.000	1.000	0.000	0.000	0.308	0.000	0.000
Replicate Prob(F)	0.4547	1.0000	1.0000	0.4547	1.0000	1.0000	0.8195	1.0000	1.0000
Treatment F	381.000	0.000	0.000	81.000	0.000	0.000	13.000	0.000	0.000
Treatment Prob(F)	0.0001	1.0000	1.0000	0.0001	1.0000	1.0000	0.0066	1.0000	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 9, continued. Percent dead American cockroaches after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN	AMERICAN
Crop Code	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH	ROACH
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Post Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment									
No. Name									
13 LAMBDA ONLY	55.0 a	95.0 a	100.0 a	55.0 a	100.0 a	100.0 a	30.0 ab	95.0 a	100.0 a
12 D-FORCE HPX	50.0 a	100.0 a	100.0 a	70.0 a	100.0 a	100.0 a	55.0 a	90.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	17.30	9.99	9.99	20.80	0.00	0.00	36.93	17.30	0.00
Standard Deviation	10.00	5.77	5.77	12.02	0.00	0.00	21.34	10.00	0.00
CV	28.57	8.88	8.45	28.84	0.0	0.0	75.33	18.22	0.0
Bartlett's X2	0.698	0.0	0.0	0.698	0.0	0.0	0.25	1.268	0.0
P(Bartlett's X2)	0.403	0.00*	0.00*	0.403	0.00*	0.00*	0.617	0.26	0.00*
Replicate F	3.000	1.000	1.000	1.462	0.000	0.000	0.268	3.000	0.000
Replicate Prob(F)	0.1170	0.4547	0.4547	0.3161	1.0000	1.0000	0.8462	0.1170	1.0000
Treatment F	37.000	381.000	381.000	37.615	0.000	0.000	6.859	114.333	0.000
Treatment Prob(F)	0.0004	0.0001	0.0001	0.0004	1.0000	1.0000	0.0300	0.0001	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 11, continued. Percent dead Argentine ants after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN
Crop Code	ANT	ANT	ANT	ANT	ANT	ANT	ANT	ANT	ANT
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment No. Name									
13 LAMBDA ONLY	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
12 D-FORCE HPX	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	2.5 b	0.0 b	0.0 b	7.5 b	0.0 b	7.5 b	27.5 b
LSD (P=.05)	0.00	0.00	4.99	0.00	0.00	9.56	0.00	9.56	26.27
Standard Deviation	0.00	0.00	2.89	0.00	0.00	5.53	0.00	5.53	15.18
CV	0.0	0.0	4.28	0.0	0.0	7.99	0.0	7.99	20.02
Bartlett's X2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Replicate F	0.000	0.000	1.000	0.000	0.000	1.000	0.000	1.000	1.000
Replicate Prob(F)	1.0000	1.0000	0.4547	1.0000	1.0000	0.4547	1.0000	0.4547	0.4547
Treatment F	0.000	0.000	1521.000	0.000	0.000	373.364	0.000	373.364	30.398
Treatment Prob(F)	1.0000	1.0000	0.0001	1.0000	1.0000	0.0001	1.0000	0.0001	0.0007

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 13, continued. Percent dead Argentine ants after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN	ARGENTIN
Crop Code	ANT	ANT	ANT	ANT	ANT	ANT	ANT	ANT	ANT
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment No. Name									
13 LAMBDA ONLY	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a	100.0 a
12 D-FORCE HPX	100.0 a	100.0 a	100.0 a	82.5 b	92.5 a	100.0 a	92.5 a	95.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 c	0.0 b	7.5 b	0.0 b	0.0 b	7.5 b
LSD (P=.05)	0.00	0.00	0.00	9.56	9.56	14.98	9.56	9.990	14.98
Standard Deviation	0.00	0.00	0.00	5.53	5.53	8.66	5.53	5.774	8.66
CV	0.0	0.0	0.0	9.09	8.61	12.52	8.61	8.88	12.52
Bartlett's X2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Replicate F	0.000	0.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000
Replicate Prob(F)	1.0000	1.0000	1.0000	0.4547	0.4547	0.4547	0.4547	0.4547	0.4547
Treatment F	0.000	0.000	0.000	373.364	406.091	152.111	406.091	381.000	152.111
Treatment Prob(F)	1.0000	1.0000	1.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 15, continued. Percent dead confused flour beetles after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR
Crop Code	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE
Part Rated	1 DAT	1 DAT	1 DAT	14 DAT	14 DAT	14 DAT	28 DAT	28 DAT	28 DAT
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment No. Name									
13 LAMBDA ONLY	50.0 a	100.0 a	100.0 a	75.0 a	100.0 a	100.0 a	30.0 a	55.0 a	75.0 a
12 D-FORCE HPX	75.0 a	100.0 a	100.0 a	15.0 b	95.0 a	100.0 a	5.0 b	50.0 a	75.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	32.63	0.00	0.00	19.13	9.99	0.00	12.90	12.90	22.34
Standard Deviation	18.86	0.00	0.00	11.06	5.77	0.00	7.45	7.45	12.91
CV	47.14	0.0	0.0	36.85	8.88	0.0	63.89	21.3	25.82
Bartlett's X2	1.671	0.0	0.0	1.124	0.0	0.0	0.059	0.059	1.124
P(Bartlett's X2)	0.196	0.00*	0.00*	0.289	0.00*	0.00*	0.809	0.809	0.289
Replicate F	0.250	0.000	0.000	1.818	1.000	0.000	2.200	2.200	0.800
Replicate Prob(F)	0.6187	1.0000	1.0000	0.2442	0.4547	1.0000	0.1889	0.1889	0.5376
Treatment F	14.825	0.000	0.000	51.545	381.000	0.000	18.800	66.800	45.000
Treatment Prob(F)	0.0049	1.0000	1.0000	0.0002	0.0001	1.0000	0.0027	0.0001	0.0002

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 17, continued. Percent dead confused flour beetles after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR	FLOUR
Crop Code	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE	BEETLE
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment No. Name									
13 LAMBDA ONLY	5.0 b	80.0 a	100.0 a	15.0 a	85.0 a	100.0 a	10.0 a	30.0 a	85.0 a
12 D-FORCE HPX	35.0 a	95.0 a	95.0 a	15.0 a	65.0 a	100.0 a	0.0 a	20.0 ab	70.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b
LSD (P=.05)	23.78	19.13	9.99	9.99	29.97	0.00	11.54	23.07	17.30
Standard Deviation	13.74	11.06	5.77	5.77	17.32	0.00	6.67	13.33	10.00
CV	103.08	18.95	8.88	57.74	34.64	0.0	200.0	80.0	19.35
Bartlett's X2	1.124	85.364	0.0	0.0	0.0	0.0	0.0	0.336	1.268
P(Bartlett's X2)	0.289	0.417	0.00*	1.00	0.001*	0.00*	0.00*	0.563	0.26
Replicate F	0.471	1.000	1.000	4.000	0.444	0.000	1.000	0.250	3.000
Replicate Prob(F)	0.7138	0.4547	0.4547	0.0701	0.7300	1.0000	0.4547	0.8587	0.1170
Treatment F	7.588	85.364	381.000	9.000	26.333	0.000	3.000	5.250	82.333
Treatment Prob(F)	0.0227	0.0001	0.0001	0.0158	0.0011	1.0000	0.1250	0.0481	0.0001

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 19, continued. Percent dead Indian meal moth larvae after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.
Crop Code	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trt Treatment No. Name									
13 LAMBDA ONLY	20.0 b	42.5 b	97.5 a	0.0 a	10.0 ab	70.0 a	0.0 a	15.0 a	92.5 a
12 D-FORCE HPX	97.5 a	100.0 a	100.0 a	0.0 a	17.5 a	85.0 a	0.0 a	10.0 a	80.0 a
14 UNTREATED	0.0 c	0.0 c	0.0 b	0.0 a	0.0 b	0.0 b	0.0 a	0.0 a	0.0 b
LSD (P=.05)	14.98	14.98	4.99	0.00	16.06	11.54	0.00	18.24	24.30
Standard Deviation	8.66	8.66	2.89	0.00	9.28	8.67	0.00	10.54	14.04
CV	22.11	18.23	4.38	0.0	101.23	14.81	0.0	126.49	24.42
Bartlett's X2	2.64	0.0	0.0	0.0	0.516	0.577	0.0	0.577	1.11
P(Bartlett's X2)	0.104	0.00*	0.00*	0.00*	0.473	0.448	0.00*	0.448	0.292
Replicate F	1.000	1.000	1.000	0.000	0.613	3.250	0.000	0.100	0.155
Replicate Prob(F)	0.4547	0.4547	0.4547	1.0000	0.6312	0.1021	1.0000	0.9571	0.9228
Treatment F	141.444	134.333	1561.000	0.000	3.581	137.250	0.000	2.100	51.085
Treatment Prob(F)	0.0001	0.0001	0.0001	1.0000	0.0947	0.0001	1.0000	0.2035	0.0002

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 21, continued. Percent dead Indian meal moth larvae after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.	I.M.M.
Crop Code	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE	LARVAE
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trit Treatment No. Name									
13 LAMBDA ONLY	0.0 a	0.0 a	5.0 a	0.0 a	0.0 a	10.0 b	0.0 a	0.0 a	2.5 a
12 D-FORCE HPX	0.0 a	2.5 a	7.5 a	5.0 a	17.5 a	27.5 a	0.0 a	2.5 a	2.5 a
14 UNTREATED	0.0 a	0.0 a	0.0 a	0.0 a	0.0 a	7.5 b	0.0 a	0.0 a	0.0 a
LSD (P=.05)	0.00	4.99	10.40	5.77	17.08	14.98	0.00	4.99	7.83
Standard Deviation	0.00	2.89	6.01	3.33	9.86	8.86	0.00	2.89	4.41
CV	0.0	346.41	144.22	200.0	169.03	57.74	0.0	346.41	264.58
Bartlett's X2	0.0	0.0	1.268	0.0	0.0	1.138	0.0	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.26	0.00*	0.00*	0.566	0.00*	0.00*	0.001*
Replicate F	0.000	1.000	1.482	1.000	1.000	3.111	0.000	1.000	0.571
Replicate Prob(F)	1.0000	0.4547	0.3161	0.4547	0.4547	0.1100	1.0000	0.4547	0.8542
Treatment F	0.000	1.000	1.815	3.000	4.200	6.333	0.000	1.000	0.429
Treatment Prob(F)	1.0000	0.4219	0.2748	0.1250	0.0723	0.0332	1.0000	0.4219	0.6899

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 23, continued. Percent dead field crickets after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to tile.

Insect Code	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Crop Code	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE	TILE
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trit Treatment No. Name									
13 LAMBDA ONLY	100.0 a	100.0 a	100.0 a	55.0 b	100.0 a	100.0 a	70.0 a	100.0 a	100.0 a
12 D-FORCE HPX	100.0 a	100.0 a	100.0 a	75.0 a	100.0 a	100.0 a	70.0 a	100.0 a	100.0 a
14 UNTREATED	0.0 b	0.0 b	0.0 b	0.0 c	0.0 b	5.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	0.00	0.00	0.00	19.13	0.00	9.99	19.98	0.00	0.00
Standard Deviation	0.00	0.00	0.00	11.06	0.00	5.77	11.55	0.00	0.00
CV	0.0	0.0	0.0	25.51	0.0	8.45	24.74	0.0	0.0
Bartlett's X2	0.0	0.0	0.0	1.124	0.0	0.0	0.818	0.0	0.0
P(Bartlett's X2)	0.00*	0.00*	0.00*	0.289	0.00*	0.00*	0.366	0.00*	0.00*
Replicate F	0.000	0.000	0.000	1.818	0.000	1.000	2.000	0.000	0.000
Replicate Prob(F)	1.0000	1.0000	1.0000	0.2442	1.0000	0.4547	0.2158	1.0000	1.0000
Treatment F	0.000	0.000	0.000	49.364	0.000	361.000	49.000	0.000	0.000
Treatment Prob(F)	1.0000	1.0000	1.0000	0.0002	1.0000	0.0001	0.0002	1.0000	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 25, continued. Percent dead field crickets after 1, 4, and 24 hours of exposure to 1, 14, and 28-day old residues applied to wood.

Insect Code	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Crop Code	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET	CRICKET
Part Rated	1 DAY	1 DAY	1 DAY	14 DAY	14 DAY	14 DAY	28 DAY	28 DAY	28 DAY
Rating Data Type	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD	WOOD
Rating Unit	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD	% DEAD
Pest Stage at Eval	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR	1 HOUR	4 HOUR	24 HOUR
Trit Treatment No. Name									
13 LAMBDA ONLY	90.0 a	100.0 a	100.0 a	50.0 a	100.0 a	100.0 a	30.0 a	95.0 a	100.0 a
12 D-FORCE HPX	65.0 b	100.0 a	100.0 a	45.0 a	100.0 a	100.0 a	45.0 a	95.0 a	100.0 a
14 UNTREATED	0.0 c	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b
LSD (P=.05)	17.30	0.00	0.00	26.43	0.00	0.00	17.30	9.99	0.00
Standard Deviation	10.00	0.00	0.00	15.28	0.00	0.00	10.00	5.77	0.00
CV	19.35	0.0	0.0	48.24	0.0	0.0	40.0	9.12	0.0
Bartlett's X2	0.698	0.0	0.0	1.268	0.0	0.0	1.268	0.0	0.0
P(Bartlett's X2)	0.403	0.00*	0.00*	0.26	0.00*	0.00*	0.26	1.00	0.00*
Replicate F	3.000	0.000	0.000	0.143	0.000	0.000	3.000	4.000	0.000
Replicate Prob(F)	0.1170	1.0000	1.0000	0.9306	1.0000	1.0000	0.1170	0.0701	1.0000
Treatment F	86.333	0.000	0.000	13.000	0.000	0.000	21.000	361.000	0.000
Treatment Prob(F)	0.0001	1.0000	1.0000	0.0096	1.0000	1.0000	0.0020	0.0001	1.0000

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed.
 The following table indicates if $\geq 90\%$ mortality was observed (Lambda-Cyhalothrin results only shown)

	Aging Period								
	1 Day			14 Days			28 Days		
	1 hr	4 hr	24 hr	1 hr	4 hr	24 hr	1 hr	4 hr	24 hr
German cockroach – Tile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
German cockroach – Wood	No	No	No	No	Yes	Yes	No	No	Yes
American Cockroach – Tile	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
American Cockroach – Wood	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Argentine Ant – Tile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Argentine Ant – Wood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Confused Flour Beetle – Tile	No	Yes	Yes	No	Yes	Yes	No	No	No
Confused Flour Beetle – Wood	No	No	Yes	No	No	Yes	No	No	No
Indian Meal Moth – Tile	No	No	Yes	No	No	No	No	No	Yes
Indian Meal Moth – Wood	No	No	No	No	No	No	No	No	No
Field Cricket – Tile	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Field Cricket - Wood	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes

- Tested a.i. application rate: Vinyl tile: 0.6 mg/9.6 square inches Lambda-Cyhalothrin or 0.7 mg/9.6 square inches Deltamethrin. Wood panel: 1.4 mg/36 square inches Lambda-Cyhalothrin or 1.7 mg/36 square inches Deltamethrin
- Surface tested, for residual studies (e.g. ceramic tile, wood panel): Vinyl tile, wood panel
- Formulation type (e.g. aerosol, granular): Aerosol
- Application type (e.g. direct, surface, area): Surface
- Timepoints at which corresponding control mortality is greater than 10%: 27.5% for Argentine ant on tile 28 days after treatment at 24 hr exposure (Table 11)

Conclusions

- Application of Lambda-Cyhalothrin at the rates mentioned above for each species caused $\geq 90\%$ mortality after the exposure times indicated on the surfaces below on the indicated days following treatment:

	Aging Period								
	1 Day			14 Days			28 Days		
	1 hr	4 hr	24 hr	1 hr	4 hr	24 hr	1 hr	4 hr	24 hr
German cockroach – Tile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
German cockroach – Wood	No	No	No	No	Yes	Yes	No	No	Yes
American Cockroach – Tile	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
American Cockroach – Wood	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Argentine Ant – Tile	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Argentine Ant – Wood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Confused Flour Beetle – Tile	No	Yes	Yes	No	Yes	Yes	No	No	No

Confused Flour Beetle – Wood	No	No	Yes	No	No	Yes	No	No	No
Indian Meal Moth – Tile	No	No	Yes	No	No	No	No	No	Yes
Indian Meal Moth – Wood	No	No	No	No	No	No	No	No	No
Field Cricket – Tile	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Field Cricket - Wood	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes

- (S)-Hydroprene, one of the active ingredients on the label, was not tested in this report.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 458629-02. Evaluation of Experimental Insecticide Formula 215-006, Compared to D-Force™ HPX, in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Adult, Indian Meal Moth Larvae, Paper Wasp, Western Yellowjacket, Honey Bee, House Fly, Stable Fly, Bed Bug, European Earwig, Silverfish, and Field Cricket. Cardoza, R., Kirkland, R. 2003.

OCSPP Product Performance Guideline: 810.3600, 40 CFR 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{AS}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{AS}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{AS}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, 40 CFR 158.640
MRID:	458629-02. Evaluation of Experimental Insecticide Formula 215-006, Compared to D-Force™ HPX, in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Adult, Indian Meal Moth Larvae, Paper Wasp, Western Yellowjacket, Honey Bee, House Fly, Stable Fly, Bed Bug, European Earwig, Silverfish, and Field Cricket. Cardoza, R., Kirkland, R. 2003.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Jonathan Berger, Sponsor
TESTING FACILITY:	Bio Research, 1738 N. Fowler Avenue, Fresno, CA 93727
STUDY DIRECTOR or INVESTIGATOR:	Reed L. Kirkland, Study Director
SUBMITTER:	Dana M. Thomas, Manager, Product Registrations
STUDY COMPLETED:	10/01/2003
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was <u>NOT</u> conducted in compliance with Good Laboratory Practice Standards as described by EPA (40 CFR Parts 160 and 792), and was never intended for that purpose.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene

CHEMICAL NAME: Not provided

A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene
0.36%

PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Evaluation of Experimental Insecticide Formula 215-006, Compared to D-Force™ HPX, in the Control of the German Cockroach, American Cockroach, Argentine Ant, Confused Flour Beetle, Indian Meal Moth Adult, Indian Meal Moth Larvae, Paper Wasp, Western Yellowjacket, Honey Bee, House Fly, Stable Fly, Bed Bug, European Earwig, Silverfish, and Field Cricket.

Purpose/Objective:

This test was conducted to evaluate an experimental aerosol insecticide, Formula 215-006, in the control of the German cockroach, American cockroach, Argentine ant, confused flour beetle, Indian meal moth adult, Indian meal moth larvae, paper wasp, western yellowjacket, honey bee, house fly, stable fly, bed bug, European earwig, silverfish, and field cricket. The trial was conducted in conjunction with other testing, with the sharing of data from the standard, D-Force™ HPX, and the untreated plots.

Materials and Methods

Test Material(s):

Formula Code: 215-006
TC-241 Lab Code: 215-017
0.0500% Lambda-cyhalothrin

D-Force™ HPX
0.06% Deltamethrin
Lot No. 343273 0201044
EPA Reg. No. 9444-217 EPA Est. No. 9444-LA-1

This study tested a direct application of a 0.05% lambda-cyhalothrin aerosol product against bed bugs (1 g product/replicate; 0.5 mg lambda-cyhalothrin/replicate), German (1 g product/replicate) and American cockroaches (1.3 g product/replicate; 0.65 mg lambda-cyhalothrin/replicate).

A mean of 1.05 g of 215-006 was applied directly to the test specimens at an a.i. dose of 0.53 mg/application Lambda-Cyhalothrin.

A mean of 1.04 g of D-Force™ HPX was applied directly to the test specimens at an a.i. dose of 0.62 mg/application Deltamethrin.

(S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.

Test Location: Fresno, California

Positive Control/Reference Standard, if used: D-Force™ HPX 0.06% Deltamethrin, applied as described above.

Species Tested:

- Common name and scientific name of each species.

Common Name: German cockroach
Scientific Name: *Blatella germanica*
Developmental Stage: Nymphs and adults

Common Name: American cockroach
Scientific Name: *Periplaneta americana*
Developmental Stage: Nymphs and adults

Common Name: Argentine ant
Scientific Name: *Linepithema humile*
Developmental Stage: Adult workers

Common Name: Confused flour beetle
Scientific Name: *Tribolium confusum*
Developmental Stage: Adults

Common Name: Indian meal moth
Scientific Name: *Plodia interpunctella*
Developmental Stage: Adults

Common Name:	Indian meal moth
Scientific Name:	<i>Plodia interpunctella</i>
Developmental Stage:	2 nd -4 th instar larvae
Common Name:	Paper wasp
Scientific Name:	<i>Polistes fuscatus</i>
Developmental Stage:	Adults
Common Name:	Western yellowjacket
Scientific Name:	<i>Vespula pensylvanica</i>
Developmental Stage:	Adults
Common Name:	Honey bee
Scientific Name:	<i>Apis mellifera</i>
Developmental Stage:	Adults
Common Name:	House fly
Scientific Name:	<i>Musca domestica</i>
Developmental Stage:	Adults
Common Name:	Stable fly
Scientific Name:	<i>Stomoxys calcitrans</i>
Developmental Stage:	Adults
Common Name:	Bed bug
Scientific Name:	<i>Cimex lectularius</i>
Developmental Stage:	Nymphs and adults
Common Name:	European earwig
Scientific Name:	<i>Forficula auricularia</i>
Developmental Stage:	Adults
Common Name:	Silverfish
Scientific Name:	<i>Lepisma saccharina</i>
Developmental Stage:	Adults and nymphs
Common Name:	Field cricket
Scientific Name:	<i>Gryllus</i> (= <i>Acheta assimilis</i>)
Developmental Stage:	Adults

- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. See above
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.

The cockroaches and honey bees used in the trial were from colonies maintained at the Bio Research facility. The Argentine ants, paper wasps, yellowjackets, and earwigs were field collected in Fresno County, CA. The remaining insects were obtained from various commercial insectories.

- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

Formula Code: 215-006
TC-241 Lab Code: 215-017
0.0500% Lambda-cyhalothrin

D-Force™ HPX
0.06% Deltamethrin
Lot No. 343273 0201044
EPA Reg. No. 9444-217 EPA Est. No. 9444-LA-1

A mean of 1.05 g of 215-006 was applied directly to the test specimens at an a.i. dose of 0.53 mg/application Lambda-Cyhalothrin.

A mean of 1.04 g of D-Force™ HPX was applied directly to the test specimens at an a.i. dose of 0.62 mg/application Deltamethrin.

(S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.

Untreated control replicates are reported but not described.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

The German cockroaches, Argentine ants, confused flour beetles, Indian meal moth larvae, bed bugs, European earwigs, and common silverfish were held in 16-ounce plastic deli cups. The American cockroaches and field

crickets were held in 32-ounce deli cups. Fluon® was painted onto the inside walls of the cups, as needed, to prevent escape. The Indian meal moth adults, paper wasps, western yellowjackets, honey bees, house flies and stable flies were held in 5.25 inch clear plastic cylindrical cages (2.25 inch radius) with brass screens at both ends.

Prior to application, the aerosol canisters were tested for proper function, and weighed. The test organisms were sprayed with a direct burst of test product from the distance of approximately 12 inches. The crawling insects were immediately transferred into clean cups to prevent drowning in any excess spray. The screen bottoms used in the flying insect holding cages allowed any excess spray to pass through, so no pooling of test substance occurred. Following each application, the aerosol canisters were again weighed, so that the amount of test product applied could be documented (Table 1). Mortality (inability to upright and maintain coordinated movement) was assessed at 0.5, 1, 2, 3, 5, 10, and 15 minutes post-treatment.

- Method(s) of application: Direct application
- Number of replicates per treatment:

German cockroach:	4 replicates of 5 roaches
American cockroach:	4 replicates of 5 roaches
Argentine ant:	4 replicates of 10 ants
Confused flour beetle:	4 replicates of 10 beetles
Indian meal moth adult:	4 replicates of 10 moths
Indian meal moth larvae:	4 replicates of 10 larvae
Paper wasp:	4 replicates of 5 wasps
Western yellowjacket:	4 replicates of 5 yellowjackets
Honey bee:	4 replicates of 5 bees
House fly:	4 replicates of 10 flies
Stable fly:	4 replicates of 10 flies
Bed bug:	4 replicates of 10 bed bugs
European earwig:	4 replicates of 10 earwigs
Silverfish:	4 replicates of 5 silverfish
Field cricket:	4 replicates of 10 crickets

- Number of individuals per replicate: See above
- Length of exposure to treatment (time in seconds, minutes or hours): 0 min
- Were tested specimens transferred to clean containers? Crawling species: Yes; flying species: No
- Experimental conditions (state relative humidity, temperature, and photoperiod): Not reported
- The type of harborage if used in the experiment: See test apparatus description above
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

Mortality (inability to upright and maintain coordinated movement) was assessed at 0.5, 1, 2, 3, 5, 10, and 15 minutes post-treatment.

- Report if morbidity and mortality were recorded separately: Not recorded separately
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):

Mortality was analyzed using LSD, CV, and Duncan's New Multiple Range Test ($p = 0.05$) using Gyllings Agriculture Research Manager program.

Data Reported/Results

Both products were effective in causing 100% mortality to all of the test organisms. The number of minutes until total kill was as follows:

<u>Test organism</u>	<u>Formula 215-006</u>	<u>D-Force HPX</u>
German cockroach	0.5	1
American cockroach	10	10
Argentine ant	0.5	1
Confused flour beetle	1	1
Indian meal moth adult	0.5	0.5
Indian meal moth larvae	0.5	1
Paper wasp	2	1
Western yellowjacket	1	1
Honey bee	0.5	1
House fly	1	0.5
Stable fly	1	1
Bed bug	0.5	1
European earwig	2	2
Silverfish	0.5	1
Field cricket	2	2
Average	1.6	1.7

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Within the time (minutes) indicated in the table above.
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): NA
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Direct
 - Timepoints at which corresponding control mortality is greater than 10%: Not observed

Conclusions

- Direct application of Lambda-Cyhalothrin at the rates mentioned on page 3 under the test substance for individual species caused $\geq 90\%$ mortality within the time (minutes) indicated in the following table:

Both products were effective in causing 100% mortality to all of the test organisms. The number of minutes until total kill was as follows:

<u>Test organism</u>	<u>Formula 215-006</u>	<u>D-Force HPX</u>
German cockroach	0.5	1
American cockroach	10	10
Argentine ant	0.5	1
Confused flour beetle	1	1
Indian meal moth adult	0.5	0.5
Indian meal moth larvae	0.5	1
Paper wasp	2	1
Western yellowjacket	1	1
Honey bee	0.5	1
House fly	1	0.5
Stable fly	1	1
Bed bug	0.5	1
European earwig	2	2
Silverfish	0.5	1
Field cricket	2	2
Average	1.6	1.7

- (S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.
- The untreated control replicates are reported but not described.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 460974-02. Efficacy Evaluations of TC-241 (0.05% Lambda-Cyhalothrin) against Selected Arthropods *in vitro*. Donahue, W.A. 2003.

OCSPP Product Performance Guideline: 810.3600, 40 CFR 158.640

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AB}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AB}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AB}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, 40 CFR 158.640
MRID:	460974-02. Efficacy Evaluations of TC-241 (0.05% Lambda-Cyhalothrin) against Selected Arthropods <i>in vitro</i> . Donahue, W.A. 2003.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Jonathan Berger, Sponsor
TESTING FACILITY:	Sierra Research Laboratories, 5100 Parker Road, Modesto, CA 95357
STUDY DIRECTOR or INVESTIGATOR:	William A. Donahue, Jr., Study Director
SUBMITTER:	Dana M. Thomas, Manager, Product Registrations
STUDY COMPLETED:	05/03/2003
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was NOT conducted in compliance with Good Laboratory Practice Standards as described by EPA (40 CFR Parts 160 and 792), and was never intended for that purpose.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Efficacy Evaluations of TC-241 (0.05% Lambda-Cyhalothrin) against Selected Arthropods *in vitro*.

Purpose/Objective:

Objective: To evaluate the efficacy (knockdown and mortality) of TC-241 against selected arthropod pests when applied as a direct application to the pest species on various substrates.

Materials and Methods

Test Material(s): TC-241, 0.05% Lambda-Cyhalothrin

(S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.

Test Location: Modesto, California

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species.

Test Species – The following adult arthropods were obtained from outside vendors, from SRL colonies or field collected in Central California and acclimated to the laboratory prior to initiation of the bioassays. 1) Cat fleas, *Ctenocephalides felis* (SRL, Modesto, CA), 2) sawtooth grain beetle, *Oryzaephilus surinamensis*– Aventis Environmental Science, now in culture at SRL), 3) stripe-tail scorpion, *Vejovis spinigerus* (field collected, Hatari Invertebrates, Portal, AZ), 4) brown dog tick, *Rhipicephalus sanguineus* (El-Labs, Soquel, CA), 5) cellar spider, *Pholcus phalangioides* (field collected, SRL, Modesto, CA), 6) house cricket, *Acheta domesticus*, (Reeves Cricket Ranch, Everson, WA), 7) carpenter ant, *Camponotus modoc*, (field collected – Mariposa Co.), blacklegged tick, 8) *Ixodes scapularis* (lab colony, Oklahoma State University, Stillwater, OK), 9) giant centipede, *Scolopendra spp.* (field collected, Hatari Invertebrates, Portal, AZ) and 10) yellowfever mosquitoes, *Aedes aegypti* (lab colony, University of California, Davis, CA). Arthropods were transferred into appropriate cages or containers, given food & water and acclimated to the laboratory for at least 1 week prior to initiation of the bioassays.

- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. See above
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains. See above
- If female adults are used - are they gravid? Not reported
- Describe rearing techniques. Not described

Experiment description:

- List the treatments including the untreated control.

TC-241, 0.05% Lambda-Cyhalothrin

A mean of 1.7 g of TC-241 was applied directly to the test specimens, delivering an a.i. dose of 0.85 mg/application Lambda-Cyhalothrin.

(S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.

Untreated control replicates consisted of specimens receiving no treatment.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):

Experimental Design – Arthropods were confined in various containers depending on species. TC-241 was shaken well and applied directly to the confined arthropods. The aerosol can was weighed before and after application to the five reps for each arthropod treatment group and a mean weight calculated for each replicate. The product was applied as a 1-second “blast” from the aerosol can per replicate being held approximately 6” away from the test container. Sand was added to each test container to absorb any excess spray so the arthropods would not drown during the evaluations. Applications were made outdoors away from the lab to avoid contamination. After treatment the test containers were brought into the laboratory for the remainder of the evaluation.

Cat fleas were placed into 1-quart glass jars, which contained approximately 0.25” of fine white dolomite sand in the bottom as a substrate. Approximately ten 1-2 week old unfed adult cat fleas were added to the jars. Five replicates were run for each test or control group in this series. The jars were covered with a fine mesh nylon screen and secured with a band lid to retain the fleas after treatment. After treatment the replicates were brought back into the laboratory for evaluation.

Stripe-tail scorpions (1/rep – 5 reps), giant centipedes (1/rep – 5 reps) brown dog ticks (~5/rep), blacklegged ticks (5/rep – 5 reps) and sawtooth grain beetles (~10/rep), house cricket (5/rep), carpenter ant (5/rep) were placed into 1 pint plastic cups with approximately 0.5” of play sand and treated as described previously. Replicates were covered with a plastic lid with small holes in it for ventilation. Treatments were made as previously described.

Cellar spiders (2-3/rep – 5 reps) and yellowfever mosquitoes (~15/rep – 5 reps) were placed into wire screened cages 3” diameter x 4” high and covered at each end with a Petri dish bottom. The formulation was applied as previously described with the aerosol can.

- Method(s) of application: Direct
- Number of replicates per treatment: 5
- Number of individuals per replicate: Variable, see test apparatus description above

- Length of exposure to treatment (time in seconds, minutes or hours): Continuous
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): 70 to 75 °F and 46 to 56% RH
- The type of harborage if used in the experiment: See test apparatus description above
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

All replicates were brought back to the laboratory for evaluation and were scored for mortality at 1 and 24 hours after treatment. Data from the five replicates were pooled and the mean calculated for the treatment or control groups. Efficacy data were corrected using Abbott's formula: $A - B \div A \times 100$, where A = % living in control group, B = % living in treatment group.

- Report if morbidity and mortality were recorded separately: Not recorded separately
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?): Data corrected for control mortality by using Abbott's equation

Data Reported/Results

Table 1. Mean percent mortality of arthropods directly treated with TC-241 (0.05% Lambda-Cyhalothrin) at designated times (hours) posttreatment. (n=5)

Formulation	Pest Species	Mean Amt. Applied (g)	% Mortality (hr)	
			1	24
TC-241	<i>C. felis</i>	1.9	100	100
	<i>O. surinamensis</i>	1.7	100	100
	<i>V. spinigerus</i>	1.8	100	100
	<i>R. sanguineus</i>	1.4	100	100
	<i>P. phalangioides</i>	1.8	100	100
	<i>A. domesticus</i>	2.2	100	100
	<i>C. modoc</i>	2.4	100	100
	<i>I. scapularis</i>	1.5	100	100
	<i>Scolopendra spp.</i>	1.0	100	100
	<i>Ae. Aegypti</i>	1.4	100	100
Untreated Control	<i>C. felis</i>	0	0	0
	<i>O. surinamensis</i>	0	2.0	4.0
	<i>V. spinigerus</i>	0	0	0
	<i>R. sanguineus</i>	0	0	4.0
	<i>P. phalangioides</i>	0	0	0
	<i>A. domesticus</i>	0	8.0	16.0
	<i>C. modoc</i>	0	0	8.0
	<i>I. scapularis</i>	0	0	0
	<i>Scolopendra spp.</i>	0	0	0
	<i>Ae. Aegypti</i>	0	0	5.8

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Within 1 hr for all species tested
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): NA
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Direct
 - Timepoints at which corresponding control mortality is greater than 10%: 24 hr for house cricket (16.0%)

Conclusions

- $\geq 90\%$ knockdown mortality within 1 hr to all species tested.
- (S)-Hydroprene, the other active ingredient on the product label, was not tested in this report.
- Insects were exposed continuously
- Replication of carpenter ants was not adequate.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 462093-04. Thermal Point Source Efficacy. Rudolf, R. 2004.

OCSPP Product Performance Guideline: 810.3600; 810.3500

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summittec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson^{PC}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess^{GB}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross^{RR}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds^{AE}
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summittec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, OCSPP 810.3500—Premise Treatment
MRID:	462093-04. Thermal Point Source Efficacy. Rudolf, R. 2004.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	Richard Moorman, Sponsor
TESTING FACILITY:	Wellmark International, 12200 Denton Road, Dallas, TX 75234
STUDY DIRECTOR or INVESTIGATOR:	Robin Rudolf, Study Director
SUBMITTER:	Gary R. Sandberg, Federal Regulatory Project Manager
STUDY COMPLETED:	07/11/2003
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	This study was conducted according to the principles of Good Laboratory Practices and is in compliance with the United States Environmental Protection Agency's Federal Insecticide, Fungicide and Rodenticide Act, Good Laboratory Practice Regulations, 40 CFR Part 160, current edition.
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Thermal Point Source Efficacy.

Purpose/Objective:

The objective of this study is to demonstrate the efficacy of thermally distributed S-hydroprene against the German cockroach *Blattella germanica*, when applied on a monthly basis.

Materials and Methods

Test Material(s): (S)-Hydroprene, applied to Nomex pads at a rate of 0.3 mg/square foot.

Test Location: Dallas, Texas

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. German cockroach, *Blattella germanica*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Nymph
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains.

The German cockroach nymphs were obtained from the Wellmark International Insectary in Dallas, Texas.

- If female adults are used - are they gravid? NA; nymphs used

- Describe rearing techniques.

- 6.01 Containment:
An appropriate container with fluon applied to the sides. The colony will need to be transferred to a new container with a fresh, smooth coating of Fluon in a few months when roaches begin to chew or scratch foot holds in the surface. If used on containers with seams in the walls you will need to use the petroleum jelly & mineral oil mixture on the seams as the surface of the seams will not be smooth enough for the Fluon to work. A mixture of 75% petroleum jelly & 25% mineral oil can be applied to the top 2 to 3 inches of the container and should keep roaches in. The application will need to be replaced when it melts and runs down the sides, becomes dry or covered with trapped roaches. Low voltage electrical current can be used primarily on very large colonies and/or containers. Nichrome wire or copper tape used for repairing circuit boards can be used. Two strips applied very close together but not touching. I am not sure where to get it but it apparently comes in tape on metallic strips. Double stick tape may also be used to temporarily contain a small number of roaches. Tape should be tested on roaches first to make sure it is sticky enough to trap them, many tapes are not. Tape will need to be replaced when it becomes dry, soiled, or covered with roaches.
- 6.03 Harborage may be added to increase the carrying capacity of any container: Cardboard dividers like those that small glass vials come packed in work well. They can be cut to fit the containers being used. They give numerous surfaces for the roaches to cling to. They allow frass and cast off skins to fall through to the bottom of the container. They should be disposed of when they become too soiled. Paper cups, paper towel tubes, egg crates, or roach motels without the glue also work.
- 6.04 Food should be supplied *ad libitum*, usually in the bottom of the container. Dry dog, cat, or rodent chow is appropriate. Canned dog or cat food or fresh fruit or vegetables may be used if dry food is not available. Do not over feed, as food will become molded or rancid before being eaten. Not more than approximately 150 ml of food should be left in a container at one time. When most of the dry food has been consumed additional food can be added on top of the old unless the existing food has started to mold. If the existing food has started to mold either the container should be cleaned or the colony should be moved to a new container. When using foods with high moisture content or a high fat content they should be removed from the container and replaced daily.
- 6.05 Water should be supplied *ad libitum* usually in the bottom of the container. Test tubes filled with water and plugged with cotton to wick the water out gradually work well. Do not use synthetic fibers as plugs as these will not wick the water out. Do not use two separate cotton balls in one tube as a space may develop between the two across which water will not wick. If cotton balls are not available the size of the tubes to be plugged use rolled cotton and pull of fan appropriate size piece to plug the tube. A dental wick placed through a small opening in any closed container of water will work. A dish with or without a sponge to hold water may be used. The roach container and the water dish will need a level surface to sit on. The dish will need to be checked and filled more frequently than any of the wicking methods.
- 6.06 Handling: Roaches can be anesthetized for a few minutes for handling purposes using carbon dioxide. Expose roaches to CO₂ for approximately 30 seconds after most of the roaches have stopped moving. More CO₂ can be administered as soon as the roaches begin to move again. The CO₂ can be readministered up to 3 times before the roaches are allowed to wake up completely. Over exposure can kill the roaches. Placing them in a refrigerator or freezer for short periods will slow them down. You will need to check them regularly to see when they are slowed enough to be handled. Prolonged exposure to low temperatures can kill them.

Experiment description:

- List the treatments including the untreated control.

(S)-Hydroprene, applied to Nomex pads at a rate of 0.3 mg/square foot.

Grouping: The nine chambers used in the study were divided into three groups of three chambers each.

Group 1: The 3 Chambers in this group were left untreated and served as the control chambers.

Group 2: The 3 Chambers assigned to this group were treated initially with a single treatment each of approximately 0.3 mg/ft² of (S)-hydroprene from the Thermal Circuits Unit #3 heater.

Group 3: The 3 Chambers in this group were treated initially and then monthly with approximately 0.3 mg/ft² of S-hydroprene from the Thermal Circuits Unit #3 heater.

- Include a description of:
 - Test arenas and/or apparatus (include site description and location):
 1. 9 each 53 sq.ft. test chambers.
 2. 108 plastic sandwich containers with mesh tops and the bottoms removed then hot glued to vinyl tile substrate, 4 per tile.
 3. 108 plastic sandwich containers with mesh tops and the bottoms removed then hot glued to ceramic tile substrate, 4 per tile.
 4. 2160 third to fourth instar German cockroaches (*Blattella germanica*), laboratory reared according to SOP BI-25.
 5. Glass vials for water in each container.
 6. Roach Diet for each container.
 7. Paper distribution sampling substrate (3 each 12"x12"per chamber treated at each treatment).
 8. Mazola™ brand Corn Oil aerosol for treating the paper sampling substrate.
 9. One Thermal Circuits Heater #3, set at 335°F for a four-hour duration heating interval.
 10. Six S-hydroprene treated Nomex™ pads for initial treatment, then three S-hydroprene treated Nomex™ pads each month to end of study.
 11. A duplicate of each S-hydroprene treated pad for determining the initial loading level of S-hydroprene.
 12. Three temperature and humidity recording devices.
 - 3.1 Identification
 - Test System Biological: German cockroach (*Blattella germanica*) nymphs were confined in plastic walled, mesh covered sandwich containers (Glad Ware® approximately 6" X 6" X 2" high), ten per container, which had the bottoms removed and hot melt glued to vinyl or ceramic flooring tiles. The Cockroach containing containers were then placed into 53 sq.ft. test chambers (described in "Description, Maintenance, and Decontamination Procedures for Insect Test Chambers", SOP #32). The design of the plastic containers was in accordance with SOP BI-25, with the exception that they did not need to be treated with Fluon™ to prevent escape.

Initially there were present in each chamber one mesh covered plastic roach container with 10 each nymphal roaches in each of three corners of the chamber per flooring substrate (vinyl and ceramic) i.e. total of six containers per chamber. Also, each chamber contained three un-infested roach containers per flooring substrate, in each of the three corners, i.e. 18 un-infested containers per chamber.

Groups 2 and 3 were treated with approximately 0.3 mg/ft² of (S)-hydroprene formulation RF-2033 initially.

At weeks 2,4,and 6, after initial treatment, each chamber was infested with 10 German Cockroach nymphs into each of three containers in treated and control chambers per flooring substrate (vinyl and ceramic, 6 containers per chamber). Monthly after the first treatment Group 3 chambers were treated with RF-2033 at approximately 0.22 grams of (S)-hydroprene.

Monitoring Treatment: During treatment, initial and residual, each chamber being treated contained three 12" x 12" corn oil treated papers (one in each of the three corners of the chamber) to capture representative treatment samples of (S)-hydroprene deposition. 24 hours after activation of the heater the samples were collected and taken to the analytical chemistry department for analysis.

- Method(s) of application: Surface treatment
- Number of replicates per treatment: 3
- Number of individuals per replicate: 10
- Length of exposure to treatment (time in seconds, minutes or hours): Continuous
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): 23.0 to 29.9 °C, 29.4 to 54.3% RH
- The type of harborage if used in the experiment: See test apparatus description above
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

Observations: Observations for roach maturity, IGR type deformities, the presence of ootheca and the hatching of F1 nymphs (reproduction) were made weekly for each infested container in each chamber to determine efficacy.

Study End Point: The study end point for each infestation was determined to be when all surviving nymphs from the infestation had achieved adult status and all containers in the infestation from the control chambers had produced F1 nymphs, (reproduced).

- Report if morbidity and mortality were recorded separately: NA; living specimens observed
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):

Simple averaging of repetitions' observations was made. Percent control was determined by the following formula, based upon the number of units producing F1 nymphs in each treatment Group.

% Control = ((# of Control Containers producing F1 nymphs – # of Treated Group Containers producing F1 nymphs) / # of Control Containers producing F1 nymphs) X 100

Data Reported/Results

Group 1

Both Substrates Combined

Initial Infestation

Date of	Week of				Affected				No. of
Count	Study	Nymphs	Adults	% Adult	Adults	% Affected	Ootheca	Nymphs	Containers Producing F1
20-Jun	Wk 1	141	15	9.6%	2	13.3%	0	0	
27-Jun	Wk 2	87	41	32.0%	2	4.9%	1	0	
4-Jul	Wk 3	15	96	86.5%	3	3.1%	3	0	
11-Jul	Wk 4	4	100	96.2%	4	4.0%	35	0	
18-Jul	Wk 5	1	97	99.0%	1	1.0%	38	1	
25-Jul	Wk 6	1	96	99.0%	2	2.1%	31	7	
1-Aug	Wk 7	0	96	100.0%	2	2.1%	42	18	
8-Aug	Wk 8	0	93	100.0%	4	4.3%	42	18	

Group 2

Both Substrates Combined

Initial Infestation

Date of	Week of				Affected				No. of
Count	Study	Nymphs	Adults	% Adult	Adults	% Affected	Ootheca	Nymphs	Containers Producing F1
19-Jun	Wk 1	127	29	18.6%	5	17.2%	0	0	
26-Jun	Wk 2	75	45	37.5%	20	44.4%	3	0	
3-Jul	Wk 3	10	78	88.6%	46	59.0%	3	0	
10-Jul	Wk 4	8	72	90.0%	48	66.7%	3	0	
17-Jul	Wk 5	2	68	97.1%	45	66.2%	3	2	
24-Jul	Wk 6	1	65	98.5%	39	60.0%	5	3	
31-Jul	Wk 7	1	63	98.4%	37	58.7%	8	3	
7-Aug	Wk 8	0	58	100.0%	47	81.0%	8	4	

Group 3

Both Substrates Combined

Initial Infestation

Date of	Week of				Affected				No. of
Count	Study	Nymphs	Adults	% Adult	Adults	% Affected	Ootheca	Nymphs	Containers Producing F1
19-Jun	Wk 1	127	32	20.1%	13	40.6%	0	0	
26-Jun	Wk 2	74	43	36.8%	20	46.5%	4	0	
3-Jul	Wk 3	22	71	76.3%	41	57.7%	4	0	
10-Jul	Wk 4	13	69	84.1%	50	72.5%	4	0	
17-Jul	Wk 5	6	62	91.2%	44	71.0%	2	1	
24-Jul	Wk 6	2	60	96.8%	41	68.3%	4	2	
31-Jul	Wk 7	0	60	100.0%	33	55.0%	7	2	
7-Aug	Wk 8	0	59	100.0%	48	81.4%	5	2	

Group 1

Both Substrates Combined

Week 2 Infestation

Date of	Week of				Affected				No. of
Count	Study	Nymphs	Adults	% Adult	Adults	% Affected	Ootheca	Nymphs	Containers Producing F1
11-Jul	Wk 4	131	0	0.0%	0	0.0%	0	0	
18-Jul	Wk 5	117	7	5.6%	0	0.0%	0	0	
25-Jul	Wk 6	49	62	55.9%	4	6.5%	0	0	
1-Aug	Wk 7	23	78	77.2%	7	9.0%	14	1	
8-Aug	Wk 8	4	77	95.1%	6	7.8%	22	2	
15-Aug	Wk 9	4	75	94.9%	2	2.7%	27	2	
22-Aug	Wk 10	2	84	97.7%	2	2.4%	12	14	
29-Aug	Wk 11	0	104	100.0%	3	2.9%	24	16	
5-Sep	Wk 12	0	99	100.0%	1	1.0%	33	18	

Group 2

Both Substrates Combined

Week 2 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected		Ootheca	Nymphs	No. of Containers Producing F1
					Adults	% Affected			
10-Jul	Wk 4	149	0	0.0%	0	0.0%	0	0	
17-Jul	Wk 5	117	13	10.0%	11	84.6%	0	0	
24-Jul	Wk 6	39	61	61.0%	46	75.4%	0	0	
31-Jul	Wk 7	14	69	83.1%	56	81.2%	6	0	
7-Aug	Wk 8	1	70	98.6%	63	90.0%	5	0	
14-Aug	Wk 9	4	67	94.4%	46	68.7%	15	0	
21-Aug	Wk 10	1	67	98.5%	44	65.7%	12	1	
28-Aug	Wk 11	0	66	100.0%	61	92.4%	12	1	
4-Sep	Wk 12	0	63	100.0%	43	68.3%	11	2	

Group 3

Both Substrates Combined

Week 2 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected		Ootheca	Nymphs	No. of Containers Producing F1
					Adults	% Affected			
10-Jul	Wk 4	164	3	1.8%	0	0.0%	1	0	
17-Jul	Wk 5	106	21	16.5%	16	76.2%	1	0	
24-Jul	Wk 6	35	71	67.0%	67	94.4%	3	0	
31-Jul	Wk 7	13	81	86.2%	74	91.4%	6	1	
7-Aug	Wk 8	3	82	96.5%	81	98.8%	4	1	
14-Aug	Wk 9	2	79	97.5%	71	89.9%	6	1	
21-Aug	Wk 10	0	77	100.0%	69	89.6%	3	2	
28-Aug	Wk 11	0	75	100.0%	74	98.7%	4	2	
4-Sep	Wk 12	0	67	100.0%	63	94.0%	5	2	

Group 1

Both Substrates Combined

Week 4 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected		Ootheca	Nymphs	No. of Containers Producing F1
					Adults	% Affected			
25-Jul	Wk 6	167	3	1.8%	0	0.0%	0	0	
1-Aug	Wk 7	115	37	24.3%	0	0.0%	0	0	
8-Aug	Wk 8	11	132	92.3%	9	6.8%	6	0	
15-Aug	Wk 9	8	135	94.4%	1	0.7%	43	0	
22-Aug	Wk 10	3	140	97.9%	0	0.0%	57	0	
29-Aug	Wk 11	3	132	97.8%	2	1.5%	37	2	
5-Sep	Wk 12	0	138	100.0%	1	0.7%	43	18	
12-Sep	Wk 13	0	128	100.0%	0	0.0%	47	18	

Group 2

Both Substrates Combined

Week 4 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected		Ootheca	Nymphs	No. of Containers Producing F1
					Adults	% Affected			
24-Aug	Wk 6	156	3	1.9%	1	33.3%	0	0	
31-Jul	Wk 7	106	38	26.4%	12	31.6%	0	0	
7-Aug	Wk 8	13	122	90.4%	88	72.1%	6	0	
14-Aug	Wk 9	4	131	97.0%	19	14.5%	31	0	
21-Aug	Wk 10	0	130	100.0%	29	22.3%	40	0	
28-Aug	Wk 11	0	132	100.0%	124	93.9%	42	3	
4-Sep	Wk 12	0	124	100.0%	37	29.8%	42	9	
11-Sep	Wk 13	0	120	100.0%	28	23.3%	45	10	

Group 3

Both Substrates Combined

Week 4 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected		Ootheca	Nymphs	No. of Containers Producing F1
					Adults	% Affected			
24-Aug	Wk 6	147	0	0.0%	0	0.0%	0	0	
31-Jul	Wk 7	109	18	14.2%	18	100.0%	0	0	
7-Aug	Wk 8	26	81	75.7%	81	100.0%	0	0	
14-Aug	Wk 9	6	90	93.8%	89	98.9%	4	0	
21-Aug	Wk 10	3	85	96.6%	83	97.6%	7	0	
28-Aug	Wk 11	0	89	100.0%	89	100.0%	6	0	
4-Sep	Wk 12	0	84	100.0%	84	100.0%	10	0	
11-Sep	Wk 13	0	82	100.0%	81	98.8%	8	0	

Group 1

Both Substrates Combined

Week 6 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected Adults	% Affected	Ootheca	No. of Containers Producing F1 Nymphs
8-Aug	Wk 8	168	1	0.6%	0	0.0%	0	0
15-Aug	Wk 9	82	64	43.8%	1	1.6%	1	4
22-Aug	Wk 10	20	113	85.0%	2	1.8%	17	5
29-Aug	Wk 11	19	120	86.3%	4	3.3%	34	5
5-Sep	Wk 12	0	105	100.0%	0	0.0%	28	8
12-Sep	Wk 13	0	90	100.0%	1	1.1%	37	11
19-Sep	Wk 14	0	65	100.0%	0	0.0%	21	16
26-Sep	Wk 15	0	77	100.0%	0	0.0%	21	18

Group 2

Both Substrates Combined

Week 6 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected Adults	% Affected	Ootheca	No. of Containers Producing F1 Nymphs
7-Aug	Wk 8	160	2	1.2%	0	0.0%	0	0
14-Aug	Wk 9	89	50	36.0%	9	18.0%	0	0
21-Aug	Wk 10	32	97	75.2%	13	13.4%	8	0
28-Aug	Wk 11	15	102	87.2%	93	91.2%	16	0
4-Sep	Wk 12	3	110	97.3%	11	10.0%	28	0
11-Sep	Wk 13	0	106	100.0%	11	10.4%	31	2
18-Sep	Wk 14	0	105	100.0%	11	10.5%	34	5
25-Sep	Wk 15	0	107	100.0%	13	12.1%	26	10

Group 3

Both Substrates Combined

Week 6 Infestation

Date of Count	Week of Study	Nymphs	Adults	% Adult	Affected Adults	% Affected	Ootheca	No. of Containers Producing F1 Nymphs
7-Aug	Wk 8	151	0	0.0%	0	0.0%	0	0
14-Aug	Wk 9	97	48	33.1%	45	93.8%	0	0
21-Aug	Wk 10	24	107	81.7%	103	96.3%	5	0
28-Aug	Wk 11	4	120	96.8%	120	100.0%	10	0
4-Sep	Wk 12	1	118	99.2%	114	96.6%	17	0
11-Sep	Wk 13	0	119	100.0%	117	98.3%	16	0
18-Sep	Wk 14	0	115	100.0%	115	100.0%	22	1
25-Sep	Wk 15	0	110	100.0%	108	98.2%	21	2

Table II. Percent Control of Reproduction

Study #2903

Group No.	NUMBER OF CONTAINERS REPRODUCING			
	INITIAL	WEEK 2	WEEK 4	WEEK 6
Group 3 (Treated Monthly)	2	2	0	2
Group 2 (Treated Once)	4	2	10	10
Group 1 (Untreated)	18	18	18	18

Group No.	PERCENT CONTROL OF REPRODUCTION			
	INITIAL	WEEK 2	WEEK 4	WEEK 6
Group 3 (Treated Monthly)	88.9	88.9	100.0	88.9
Group 2 (Treated Once)	77.8	88.9	44.4	44.4

- Deviations or amendments from the protocol. None
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. Reproduction (F1 hatch): Week 4 when treated monthly. Not observed or not determinable for other endpoints
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Vinyl tile, ceramic tile
 - Formulation type (e.g. aerosol, granular): Liquid
 - Application type (e.g. direct, surface, area): Surface
 - Timepoints at which corresponding control mortality is greater than 10%: NA; living specimens observed

Conclusions

- (S)-Hydroprene, applied to Nomex pads at a rate of 0.3 mg/square foot, caused $\geq 90\%$ reduction in reproduction (production of F1 progeny) at 4 weeks when (S)-Hydroprene was reapplied monthly.
- $\geq 90\%$ efficacy for other endpoints was either not observed or could not be determined from the data collected.
- Lambda-Cyhalothrin, the other active ingredient in the labeled formulation, was not tested in this study.
- The test product is a different formulation than the proposed product.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 497775-12. Evaluation of Gentrol® Aerosol for Efficacy against Bed Bugs. Gaynor, W.J. 2015.

OCSP Product Performance Guideline: 810.3600; 810.3500

Product Name: RF2228 LH Aerosol
EPA Reg. No. or File Symbol: 89459-IU
Decision number: 511409
DP number: 431044

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-307

Primary Reviewer:
Chris Peterson, Ph.D.

Signature: Chris Peterson ^{AE}
Date: 05/31/2016

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess ^{AE}
Date: 05/31/2016

Robert H. Ross, M.S. Program Manager

Signature: Robert H. Ross ^{AE}
Date: 05/31/2016

Quality Assurance:
Angela M. Edmonds, B.S.


Signature: Angela M. Edmonds
Date: 05/31/2016

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.
Summitec Corp. for the U.S. Environmental Protection Agency under Contract No. EP-W-11-014

**EFFICACY STUDY DATA EVALUATION RECORD (COMPLETED STUDY) -
Registration**

Primary Reviewer's Name/Title: Chris Peterson, Toxicologist

STUDY TYPE:	PRODUCT PERFORMANCE: OCSPP 810.3600, OCSPP 810.3500
MRID:	497775-12. Evaluation of Gentrol® Aerosol for Efficacy against Bed Bugs. Gaynor, W.J. 2015.
DP BARCODE:	431044
DECISION NO:	511409
SUBMISSION NO:	977635
SPONSOR:	<div style="display: flex; align-items: center;"><div style="margin-right: 10px;">[Illegible]</div></div>
TESTING FACILITY:	Insect Control and Research, Inc., 1330 Dillon Heights Avenue, Baltimore, MD 21228
STUDY DIRECTOR or INVESTIGATOR:	William J. Gaynor, Study Director
SUBMITTER:	James McFadden, Director, Regulatory Affairs
STUDY COMPLETED:	24/10/2003
CONFIDENTIALITY CLAIMS:	None
GOOD LABORATORY PRACTICE:	<div style="border: 1px solid black; padding: 5px;">This study was not conducted in accordance with Good Laboratory Practices as set forth in 40 CFR Part 160.</div>
TEST MATERIAL:	PRODUCT NAME: RF2228 LH Aerosol EPA REGISTRATION NUMBER OR FILE SYMBOL: 89459-IU ACTIVE INGREDIENT NAME: Lambda-Cyhalothrin, (S)-Hydroprene CHEMICAL NAME: Not provided A.I. %: Lambda-Cyhalothrin 0.05%, (S)-Hydroprene 0.36% PC CODE: PRIA

CAS NO.: Lambda-Cyhalothrin 91465-08-6, (S)-
Hydroprene 65733-18-8

FORMULATION TYPE: Aerosol

PRODUCT APPLICATION RATE(S): Crack and crevice:
1 second/linear foot (heavy infestations), 1 sec/3 linear feet
(light infestations), 1 to 5 seconds/3 cubic feet (voids).

ACTIVE INGREDIENT APPLICATION RATE(S): Not
calculable.

Efficacy Study Data Evaluation Record

Title: Evaluation of Gentrol® Aerosol for Efficacy against Bed Bugs.

Purpose/Objective:

To evaluate the efficacy of Gentrol® against bed bugs in a controlled laboratory environment.

Materials and Methods

Test Material(s): Gentrol® (EPA Reg. no. 2724-484), applied at 0.021 g of the product to three-inch diameter wooden disks. The active ingredient concentration and identity were not reported, therefore a.i. rate could not be determined.

Test Location: Baltimore, Maryland

Positive Control/Reference Standard, if used: Not used

Species Tested:

- Common name and scientific name of each species. Bed bug, *Cimex lectularius*
- Life stage as egg or nymph or larvae including stadia; or adult and sex and age. Mid to late instars
- Describe the insecticide susceptibility status of the test population. Not reported
- Describe the origin of field collected strains. Not reported
- If female adults are used - are they gravid? NA; instars used
- Describe rearing techniques. Blood fed on rabbits

Experiment description:

- List the treatments including the untreated control.

Gentrol®, applied at 0.021 g of the product to three-inch diameter wooden disks.

Treatment of Control Bed Bugs

Each control replicate will be subjected to the same procedures outlined above with the exception that the wooden disks will not be treated. The controls will be housed in a separate room under similar environmental conditions as the test replicates for the duration of the study.

- Include a description of:

- Test arenas and/or apparatus (include site description and location):

Five treatment discs will be placed on the test chamber floor evenly spaced within a 2 ft x 2 ft marked area on a sheet of brown kraft paper. The GENTROL® Aerosol will be applied as directed on the label, and the discs will be allowed to dry for 30 minutes.

The discs will then be placed on the floor with the unsprayed side up. They will be treated again as described above. After the 30 minute drying period the disks will be placed on 1/8" plastic spacers on the bottom of a clean container. This gap will allow bed bugs to shelter beneath the discs. Each container will be marked and coded.

The bed bugs will have received a blood meal within 24 hours prior to their introduction into the containers. The bugs will be anesthetized with CO₂ and twenty will be placed in each treatment container. The containers will have the mesh lids taped in place. The containers of bed bugs will then be kept at 80° ± 10°F and 70% ± 10% RH.

At day 14, the bedbugs will be anesthetized with CO₂ and the wooden discs removed from the containers. The bed bugs will remain in the containers. The discs will be retreated as described above and replaced in the containers.

- Method(s) of application: Surface
- Number of replicates per treatment: 5
- Number of individuals per replicate: 20
- Length of exposure to treatment (time in seconds, minutes or hours): Continuous, with retreatment at 14 days
- Were tested specimens transferred to clean containers? No
- Experimental conditions (state relative humidity, temperature, and photoperiod): 80° ± 10°F and 70% ± 10% RH.
- The type of harborage if used in the experiment: See test apparatus description above.
- The data and/or endpoints that were recorded and how they were assessed (e.g., prodded with a needle to see if specimens move):

The bed bugs will be observed for survival and maturation weekly until the control replicates show an F₁ generation. One week after the appearance of the F₁ all containers will be placed in the freezer for sufficient time to kill all bed bugs. Each replicate will then be examined and the numbers of each life stage counted.

- Report if morbidity and mortality were recorded separately: NA; living specimens observed
- Statistical analysis conducted and justification for selecting the approach to data analysis and statistics used (were data corrected to account for abnormalities in the data/study design, what level of significance was used, what were the confidence intervals around the mean value(s), was a median value also reported?):

Data will be analyzed with appropriate statistical tests to discriminate between production of adults and F₁ nymphs in the treated and control containers. This analysis is normally done by Analysis of Variance (ANOVA), followed by Duncan's New Multiple Range Test or an equivalent procedure.

Data Reported/Results

Table 1. Bed Bug Summary Data					
Product	Replication	Avg Wt.	% Remaining Nymphs	% Becoming Adults	Number of F1
Control	1	N/A	0	90	40
	2	N/A	0	60	28
	3	N/A	0	75	42
	4	N/A	0	75	95
	5	N/A	0	85	102
	Avg	N/A	0	77	61
Gentrol®	1	0.022	15	35	0
	2	0.019	0	35	16
	3	0.022	5	25	0
	4	0.022	10	15	0
	5	0.022	5	25	0
	Avg	0.021	7	27	3

- Deviations or amendments from the protocol. None reported
- For each tested species, report the % efficacy (e.g. knockdown, mortality, repellency) for each treatment group. Include the following information, if applicable:
 - Timepoints (e.g., 4 h, 24 h) at which greater than 90% efficacy was observed. NA; although a numerical difference is observable, 90% efficacy could not be calculated from these data
 - Tested a.i. application rate: Not determinable
 - Surface tested, for residual studies (e.g. ceramic tile, wood panel): Wood disk
 - Formulation type (e.g. aerosol, granular): Aerosol
 - Application type (e.g. direct, surface, area): Surface
 - Timepoints at which corresponding control mortality is greater than 10%: NA; living specimens observed

Conclusions

- 90% efficacy was not reached endpoints that would support control/kills/prevents adult emergence for the application of 0.021 g of Gentrol to wooden disks.
- Prevention of egg laying was only achieved after a second reapplication of hydroprene
- Control mortality was over 23%